ASSESSMENT AND REVISION OF A PAEDIATRIC MILD HEARING LOSS BROCHURE

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ABSTRACT

Purpose: This study evaluated, revised, and assessed improvements of a paediatric mild hearing loss brochure for readability and suitability.

Method: The brochure was evaluated for readability using three readability formulas: (1) F-K, (2) FOG, and (3) SMOG. Suitability was assessed using the SAM tool. The brochure was then revised using best practice guidelines, then re-evaluated using the same method as for the original. Learner verification was undertaken to ascertain improvements along measures of comprehension, self-efficacy, and preferences by way of an online Qualtrics survey.

Results: Readability assessment of the original brochure indicated that it was written at a level too difficult for its intended recipients. Evaluation of the suitability was determined to be 'adequate'. Assessment of the revised brochure showed significant improvements in both readability and suitability. Results of statistical testing indicated that there were no significant differences between the original and the revised brochure in terms of comprehension, self-efficacy, and preferences.

Conclusion: Health professionals have a responsibility to ensure that the health education materials provided to parents of children with mild hearing loss are readable, suitable, and promote understanding. To this effect, existing resources should, if indicated, be revised or new resources be developed which support the health literacy of the intended recipients. Further research is needed to identify whether significant improvements can be gained by revising health materials within the field of audiology.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of variance
ASHA	American Speech Language and Hearing Association
dB HL	Decibel hearing level
DHB	District Health Board
F-K	Flesch-Kincaid Reading Ease
FOG	Gunning Fog Index
FRE	Flesch Reading Ease
HAUG	Hearing aid user guide
HL	Hearing loss
Hz	Hertz
MHL	Mild hearing loss
MOH	Ministry of Health
OECD	Organisation for Economic Co-operation and Development
RGL	Reading grade level
SAM	Suitability Assessment of Materials
SMOG	Simple Measure of Gobbledygook
URL	Unique resource locator
WHO	World Health Organisation

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Chapter 1: Introduction

1.1 Hearing Loss in Children

Prevalence of disabling hearing loss (HL) (40 decibel hearing level (dB HL) in the better ear in adults, and 30 dB HL for children) has been estimated to be more than 5% - or 466 million of the world's population, a number predicted to grow to over 900 million by 2050 (World Health Organisation [WHO], 2020). This makes HL the most prevalent disability worldwide (WHO, 2004). The WHO predicts that 34 million children globally (1.7%) are affected by disabling HL (WHO, 2020). Data for prevalence rates for HL in children in New Zealand is collected and reported annually through the Deafness Notification Database, drawing figures from audiology clinician reporting of children under the age of 19 years with newly diagnosed permanent HL. In 2018, 207 notifications were made to the database. Using international prevalence estimates, based on a population of 1.167 million children, 245 children per year are predicted to be diagnosed with HL in New Zealand (Digby et al., 2014). The National Screening Unit (NSU) estimates that between 135 and 170 babies are born in New Zealand per year with a permanent HL (NSU, 2014). This suggests that the difference in HL present at birth and HL notified to the database is attributable to late onset or acquired HL.

Māori children are over-represented in rates of HL with the number of diagnoses disproportionate to the population (Digby et al., 2014; Statistics New Zealand - Tatauranga Aotearoa, 2014). In 2018, 39% of reported HL were assigned to Māori children, who make up only 22% of the population (Digby, 2019). In comparison, New Zealand European at 67% of the population accounted for 55% of the total HL rate (Digby, 2019). Māori are also more likely to have an additional disability, further contributing to expected poor outcomes (Statistics New Zealand - Tatauranga Aotearoa, 2014; Wynd, 2015).

1.1.1 Mild Hearing Loss in Children

There is currently no clear standardised audiological definition for mild hearing loss (MHL). The classifications adopted in various countries differ based on frequencies tested, types of test carried out (e.g. air conduction, bone conduction, auditory brainstem response), and the criteria used to report thresholds (Ross et al., 2008). In New Zealand, MHL is defined as a loss of hearing where average thresholds at 500 – 4000 Hertz (Hz) are in the range of 26 - 40 dB HL, based on the Clark (1981) classifications for HL (Digby, 2019). For purposes of this study, MHL refers to a permanent loss of the Clark (1981) classification which is un-remediable.

1.1.1.1 Prevalence of Mild Hearing Loss in Children

In New Zealand, MHL among children is reportedly the highest severity type being identified as 54% of all ranges of severity (Digby, 2019). Newborn screening programmes (New Zealand included) often do not pick up a MHL (Cone et al., 2010; Ross et al., 2008), and given the nature of these losses, can be difficult to detect. It is expected therefore, that rates for children with a MHL will be even higher than those reported (McKay et al., 2008). International figures support New Zealand data that MHL prevalence rates in children is far higher than other severity types (Ching et al., 2006; Feder et al., 2017; Moore et al., 2019). In countries that include MHL as part of their screening programmes, rates of this type of HL are reported to be substantial. A study by Fitzpatrick et al. (2014) for example, found that more than 40% of infants identified by a newborn hearing screening program in Canada, have permanent MHL. Furthermore, Māori are more likely to have a mild degree of HL which often goes undiagnosed or is diagnosed late (Digby, 2019; Digby et al., 2014). Indeed, Māori children are currently being diagnosed an average of 7.5 months later than non-Māori (Digby, 2019). In addition, disparities in access to and through the health system for Māori, may also

go some way to contributing to under-reporting (Jansen et al., 2008). Gibb et al. (2019) found that Māori and Pacific children, those living in areas of deprivation, children with younger mothers, and those with a worse health status are less likely to complete these checks. Late diagnosis can delay successful intervention, thereby contributing to poorer outcomes.

1.1.1.2 Impact of Mild Hearing Loss on Children

Although the WHO defines disabling HL in children as being > 30 dB HL, numerous studies have determined that the impact of even lesser degrees of HL on children in terms of speech and language development, academic performance, emotional, and psychosocial outcomes can be considerable (Bess et al., 1998; Cone et al., 2010; Đoković et al., 2014; Fitzpatrick et al., 2019; Winiger et al., 2016). The far-reaching consequences of the impact of MHL can stretch beyond the HL itself with secondary aspects such as embarrassment, social exclusion, behaviour, and tension within the family also experienced by the child (Northern & Downs, 2014; Ross et al., 2008). Furthermore, future vocational opportunities and subsequent economic and societal issues may result from these disparities.

Research undertaken in the 1980s and 1990s summarised in reviews, highlighted the risk for children with untreated MHL regarding poor academic performance and language outcomes when compared to children with normal hearing particularly in the areas of reading, vocabulary and phonological skills (Tharpe, 2008; Wake et al., 2006). A similar review by Winiger et al (2016) involving 69 articles spanning more than 50 years, reported a large body of evidence which highlighted negative effects of untreated MHL in children, with challenges commonly associated with speech recognition, language development, listening effort, academic performance, emotional and psychosocial well-being. Similarly, results from a recent study undertaken by Moore et al. (2019) on children aged between 6 and 11 years with HL between 15 and 30 dB HL, found poorer auditory processing, cognitive abilities, and

speech in noise difficulty relative to children with normal hearing, with a direct relationship between increasing degree of HL and poorer outcomes. Dokovic et al. (2014) found that children with a MHL who were unaided presented with deficits in morphosyntactic skills and phonological memory when compared to children with normal hearing.

In contrast to this evidence, a longitudinal study undertaken on 48 children found a minimal impact on speech language development in under 3 year olds who had their HL identified early, however, assessments at later preschool ages identified lower levels of performance in communication development, prompting the authors to highlight the risk of progressive loss in these children (Fitzpatrick et al., 2018). Indeed, as discussed earlier, children with mild degrees of HL are often identified late, and progression of this loss is predicted to occur in 20 - 30% of cases (Fitzpatrick et al., 2017). Further it has been determined that even when early identification is established, studies have shown poorer language development in these children (Yoshinaga-Itano et al., 2008).

Although comparison of these studies is challenging due to the differing definitions of degree of loss used, and measures utilised, it is clear that the impact of children with MHL even at levels < 30 dB HL when compared to children with normal hearing is substantial (Ross et al., 2008). Decisions based around how to provide services and management for these children rely on knowledge of these impacts and more studies are needed to determine the level at which intervention is required (McKay et al., 2008).

1.1.1.3 Management of Mild Hearing Loss in Children

While the efficacy of early diagnosis and intervention for children with moderate or worse degrees of HL is unequivocal, as discussed previously, the risk for adverse effects of MHL on children is becoming more apparent. This research suggests that while the diagnosis of MHL is important, the evidence for intervention for these children is less clear (McKay et

al., 2008; Most, 2006). Indeed, children with more severe degrees of HL have been found to be more likely to have support in the form of auditory rehabilitation, hearing device use, and support in schools (Antia et al., 2009; Kuppler et al., 2013), meaning that children with MHL often miss out on these support structures. Because there are no guidelines for intervention and rehabilitation for this cohort, support has been largely fragmented (Fitzpatrick et al., 2014; Holstrum et al., 2008). Given MHL is the most prevalent of all severities of HL, and that many of these losses are progressive in nature, it is crucial that research is undertaken to determine how best to approach the management in order to mitigate the adverse impacts of this severity of loss.

Approaches to the management of care in terms of intervention and/or amplification in children with MHL is often based on a failure-based 'wait and see' method, monitoring for either a decline in speech and language development, academic performance or change in hearing (Winiger et al., 2016). Best practice approaches are unknown to practitioners due to a lack of efficacy studies (Holstrum et al., 2008), therefore management recommendations based on a 'case by case' basis have been advocated in order to tailor care to individual's needs (Bagatto, 2020). More recently there has been an increase in early fitting of hearing devices based on emerging evidence of the benefits of early amplification for children with MHL (Fitzpatrick et al., 2014; Tomblin et al., 2014), however there remains a measure of uncertainty, as the evidence shows that not all children with MHL receive benefit, and that the audiogram alone is insufficient in determining risk (Holstrum et al., 2008). Walker et al. (2015) found hearing aid use in children aged 5 - 7 years with MHL resulted in better vocabulary and grammar outcomes, and was the largest predictor of expressive language scores. The authors suggested that inconsistent and non-use of hearing aids in children with MHL reported in studies by Fitzpatrick et al. (2010) and Walker et al. (2013), could be remediated by early intervention.

Due to a paucity of information about the benefits of amplification and what components of intervention are appropriate, it has been suggested that answers may be best elicited from parents (Fitzpatrick et al., 2019). In order that practitioners are able to provide appropriate and supportive care, an understanding of parental perspectives and experiences is needed (Grandpierre et al., 2018). Moreover, because there is no single protocol for the management of children with MHL, it is essential that parents are educated about the impact of this severity of loss, and available interventions, so they can make informed decisions regarding care (Winiger et al., 2016). Communication and informational support have been highlighted by parents as important needs in order to successfully navigate choices pertaining to their child's interventions (Scarinci et al., 2018). Improving outcomes is vital to ensuring that a child with MHL can achieve at the same level as children with normal hearing. Although early identification and intervention is paramount, successful outcomes can be augmented by enabling parental knowledge, self-efficacy and the ability to manage care for their child.

1.1.1.3.1 Whānau Centered Approach

The term family-centered care came into existence in the 1960s within the health care domain as practitioners began to encourage a greater role of decision making for families (Roush & Kamo, 2014). Today there is compelling evidence that implementation of family centered care in paediatric health care leads to improved outcomes in terms of; enhanced child and family health, improved quality of life within the family, greater service satisfaction, better family-professional communication, and improved service cost efficiency (Ekberg et al., 2018). Adopting a model of family centered care is therefore considered to be 'best practice' for the delivery of intervention services for children with HL and their families with the goal of developing empowered families, who are able to make appropriate decisions

for themselves and their child (American Speech Language and Hearing Association [ASHA], 2008). Further, Moeller (2000), identified family involvement as being one of the strongest contributing factors in outcomes of language development. Aligning identification and intervention service delivery to the preferences and expectations of families can have a substantial impact on the outcomes for children with HL (Fitzpatrick et al., 2008).

Studies have highlighted the importance of identifying parent's perspectives in determining appropriate care for children with HL (Fitzpatrick et al., 2008). Fitzpatrick et al. (2008) interviewed 17 families to ascertain the components of service delivery that were most important to families of children with HL. Their findings showed the main factors revolved around; service management, providing appropriate information, and parental support. Nickbakht et al. (2019), undertook an explorative qualitative study involving 28 participants to extract thematic preferences for HL intervention. The 4 main themes reported in this study included families requiring: ongoing support from professionals, information specific to their needs, additional support for those with dual or multiple disabilities, and support from other families (Nickbakht, 2019).

There is however, a lack of research within the context of parent's views and experiences for children with MHL, which is necessary to tailor care and support for this cohort due to management differing from the more severe HL degrees (Grandpierre et al., 2018). Grandpierre et al. (2018) used semi-structured interviews with parents of children diagnosed with MHL. Parents in this study reported that specifically they required more information on HL, intervention and amplification options, and longer-term support across the early school years. The authors also proposed that further studies be conducted on parents from a range of socioeconomic levels in order to assimilate a broader understanding of family's needs. A similar study by Fitzpatrick et al. (2016) additionally found that parents of

children with a MHL felt confused about information regarding amplification and intervention given by audiologists which hampered decision making.

1.1.1.3.2 Shared Decision Making

Because families are required to make a number of decisions from a diagnosis of HL through intervention and rehabilitation, they require a wealth of information and support. Parents are tasked with decision making regarding interventions such as; communication approach, speech language therapy, amplification/technology options, funding options, social and educational support, and habilitation, with children having HL and additional disabilities requiring additional support (Nickbakht et al., 2019). For parents of children with a MHL, decision making around interventions is more complex as optimal interventions are less clear cut (Bagatto, 2020). Ultimately, the goal of providing informational counselling should serve as a basis for enabling the ability of families to make well informed and timely decisions. The audiologist's role in informational counseling is the provision of clear, concise and unbiased explanations and sufficient information, affording families the ability to make informed choices (ASHA, 2008). Pryce and Hall (2014) stress that shared decision making should be practiced through both the sharing of information, and equality of relationships between the practitioners and clients.

Légaré and Witteman (2013), identified three key elements of shared decision making; acknowledgement that a decision is required, knowing and understanding the best evidence available concerning the risks and benefits, and including the preferences and values of the patient into the decision. A qualitative study undertaken by Laplante-Levesque et al. (2010) aimed to observe client's experiences of shared decision making within audiology, with findings highlighting the importance of a client centered approach. Pryce and Hall (2014) explored the concept of shared decision making within the audiology context.

Their findings suggest that when shared decision making is practiced, there is a corresponding improvement in patient knowledge and involvement in care. As such there may be a subsequent reduction in unwanted variation in health care use and uptake, misdiagnosis of patient preference, and health care costs (Kelly-Campbell & Manchaiah, 2020). Shared decision making therefore, can alleviate pressure on clinicians by liberating them from being the 'expert', and that empowering the client enables them to assume a greater responsibility for their own choices (Kelly-Campbell & Manchaiah, 2020). When shared decision making is practiced, patients receive better outcomes and experiences, however a patient's degree of involvement is likely dictated by their level of health literacy meaning that sources of information must be appropriate for all members of the target audience (Stacey et al., 2017).

1.2 Sources of Health Information

Optimal health outcomes are reliant on the ability of the person to access accurate, reliable and appropriate health information. An understanding of where patients obtain health-related information is vital to help patients receive high quality resources, and enable participation in their own health decisions (Oedekoven et al., 2019). Although there is little information on where parents seek health information from (Fagnano et al., 2012), many studies have found that the choice and use of health sources is related to a person's level of health literacy (Oedekoven et al., 2019). Health literacy will be discussed in the proceeding section. Consumers of healthcare may access information from a variety of sources including verbal, written and online, all of which have varying degrees of accuracy and usefulness (Fagnano et al., 2012).

1.2.1 Verbal Information

Verbal information is commonly obtained from health care practitioners, family, friends, and the media (Kelly-Campbell & Manchaiah, 2020). Studies have found that patients' preferred source of information is their health practitioner (Fagnano et al., 2012; Oedekoven et al., 2019). However, practitioners generally have far higher levels of education than that of the general population, and are subsequently prone to the use of jargon and a level of complexity higher than patients are able to understand (Aaronson et al., 2018; Castro et al., 2007). Given this gulf, the health care professional has a responsibility to guide access to appropriate sources of information, and spend time ensuring the information is understood regardless of the source (Fagnano et al., 2012; Freda, 2005).

Following diagnosis of HL in a child, the audiologist is required to verbally explain the results to parents and outline 'next steps' in a sensitive and culturally appropriate fashion (Ministry of Health – Manatū Hauora [MOH], 2013). However, research has suggested that many parents feel dissatisfied with the way in which this information has been conveyed, citing the discussion as being 'rushed', constant use of jargon, and assumptions of pre-existing parental knowledge (Russ et al., 2004; Tattersall & Young, 2006). Moreover, verbal recall of information is limited, with only 50% of information recalled after it is given, 50% of which is recalled incorrectly (Aaronson et al., 2019; Doak et al., 1996; Kessels, 2003). In addition, given the magnitude of the diagnosis, parents may take little onboard until they have a chance to come to terms with this news (Roush & Kamo, 2014). It is therefore crucial that verbal information is consolidated and supplemented with appropriate written educational materials.

1.2.2 Written Information

Patients access health care information in a written format from sources such as leaflets, reports, magazine articles, and user guides. Verbal information given by clinicians should be supplemented with written materials in order to reinforce the message (Hoffman & Ladner, 2012). In addition, verbal conveyance of all key messages is unlikely to be achieved by busy health professionals (Klingbeil et al., 1995). Written materials are vital in guiding patients in understanding a diagnosis or aiding a decision about a procedure (Prieto et al., 2020).

In New Zealand brochures or pamphlets designed to give an explanation of HL, what this means for the child, and how to help manage the HL, are given to parents of children diagnosed with HL. Specifically, the NSU supplies brochures outlining these aspects which are distributed by audiologists in a District Health Board (DHB) setting. However, distribution of these materials does not in itself confer patient education. They are only useful if the information contained is comprehendible by the reader. A study by Arnold et al. (2006) evaluated the readability and suitability of brochures provided by the newborn hearing screening service in 48 states of the United States of America and Puerto Rico and found that 92% of them were above the recommended reading grade level and unsuitable for readers. Similar studies have resulted in similar findings (Davis et al., 1994; Freda, 2005; Joubert & Githinji, 2013). It has been suggested that if a difficult section of a pamphlet is encountered, the individual will stop reading it (Klingbeil et al, 1995).

1.2.3 Online Information

If written health materials are too difficult to comprehend, patients may instead access the internet for information. Couper et al. (2010) report that health decisions made by an

individual are most heavily influenced by information sourced from the internet, second only to professional advice. A study by Boston et al. (2005) reported that over 80% of parents with children who had otolaryngologic issues had access to the internet, and that more than half of those parents used the internet as the source of information regarding their child's illness. Given the increase in people accessing the internet, this figure is likely to now be higher. Although many sources of online information can be beneficial, there are concerns over the accuracy, currency, and non-regulation of some internet-based health information (Holland & Fagnano, 2008; Kunst et al., 2002). In addition, many individuals are not equipped in assessing the quality of web-based health materials (Fox, 2006).

Numerous studies have found that health information on the internet is written at a level which is too difficult for the average adult (Berland et al., 2001; Laplante-Levesque & Thoren, 2015; Manchaiah et al., 2019), with studies in the paediatric field confirming these findings (Prieto et al., 2019; Wong & Levi, 2017). Benefits of online information are therefore largely dependent on the quality of these materials which is currently lacking.

1.3 Health Literacy

1.3.1 Definition of Health Literacy

Fundamental to the benefit derived from the provision of health materials is the ability of consumers to comprehend the information given. The term health literacy encompasses this concept, whereby making appropriate health care decisions involves a number of skills that enable the consumer to function effectively within the health system, and act appropriately on the information received (Berkman et al., 2011). An oft cited definition by Parker and Raztan (2000) describes health literacy in terms of "the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions" (pg. iv). In its most broad sense, an

adequate level of health literacy enables an individual to take charge of their personal, family, and community health (Sørensen et al., 2012). A number of skills have been identified as essential to the attainment of health literacy: (1) Verbal literacy – listening and speaking effectually, (2) Written literacy – being able to read and understand written language, and (3) Numeracy – being able to use quantitative skills to undertake tasks (Berkman et al., 2011). Other authors propose an additional set of skills required; social, cognitive, and motivational skills, and being able to navigate the internet (Nutbeam, 2008).

More recently, focus has shifted from the view that health literacy is solely determined from an individual's ability, to the combined effects of a person's skills and the demands of the health system (Shoemaker et al., 2014; Sørensen et al., 2012). This view focuses on consideration of the role of the health care system in meeting the health literacy needs of the consumer and identifies a complex interaction of both internal and external factors (McGee, 2010; Prins & Mooney, 2014). These factors are further expanded by the US Department of Health and Human Services and the US National Institutes of Health as: communication between health care providers and individuals, culture, demands of the health system, health topic knowledge, and the demands of a situation (Kelly-Campbell & Manchaiah, 2020). In New Zealand, the MOH highlights the role that the system has in contributing to an individual's health literacy through the design, processes, and funding of the system, the degree of complexity of the health topic, the health carer's communication skills, and the complexity of resources and messages via media (MOH, 2012).

1.3.2 Prevalence of Low Health Literacy

Although there are many definitions of health literacy, prevalence numbers are usually derived in terms of the ability to read simple text and write basic statements (Nutbeam, 2008). In 2003, the US Department of Education undertook a large scale survey of more than

19,000 adults which reported 36% showing either ‘basic’ or ‘below basic’ health literacy skills, an equivalent of around 80 million people. The following year, the US Institute of Medicine reported that almost 50% all Americans had difficulty comprehending and acting on health information (Institute of Medicine, 2004). In addition, a 2007 report from the UN Development Program estimated that between 7 and 47% of adults from the Organisation for Economic Co-operation and Development (OECD) countries lack functional literacy skills, and that the number in developing countries are much higher (Nutbeam, 2008). In effect, this means that these adults will have difficulty reading and comprehending instructions on prescription medicine or filling out forms (Berkman et al., 2011).

In New Zealand, the picture is somewhat worse, with a study involving 7000 adults in 2006 demonstrating that 56.2% had health literacy skills which were inadequate, and further that levels for Māori were substantially lower at 75-80% than that of non-Māori (MOH, 2010). In addition, certain groups have been proposed as having a higher prevalence of poor health literacy: the elderly, minorities, impoverished, and those having not completed High School (Berkman et al., 2011; Zamora & Clingerman, 2011). Health practitioners may therefore over-estimate the ability of the general population to comprehend and act appropriately on the information which they are given.

1.3.3 Impact of Low Health Literacy

Individuals with low health literacy have been found to have increased rates of hospital admission, higher rates of emergency care, lower preventative care use, lower knowledge regarding illness, poorer interpretation and recall of health instruction, and lower overall health (Aaronson et al., 2019; Berkman et al., 2011; Nutbeam, 2008). In addition, embarrassment and shame have been shown to increase barriers to patients with low health literacy asking for medical advice and help (Parikh et al., 1996). Fear, stigma, and low self-

esteem are commonly experienced by individuals with low health literacy levels (Parikh et al., 1996). Health literacy has been shown to be a stronger predictor of health status than socioeconomic status, age, ethnicity, or level of education (Institute of Medicine, 2004). Moreover, high costs to the health care system due to higher rates of complications and preventable illness, has also been associated with low health literacy (Aaronson et al., 2018), with subsequent by-in from policy makers and providers (Nutbeam, 2008; Rasu et al., 2015, Yin et al., 2013).

Racial and ethnic health disparities may be accentuated by low health literacy potentially contributing to negative outcomes and exacerbating existing inequalities (Berkman et al., 2011; Prins & Mooney, 2014). People with low levels of health literacy are disproportionately from minority ethnic or low socioeconomic groups, the same groups at risk for increased morbidity and mortality (Yin et al., 2013). In New Zealand, Māori have both poorer health and health literacy statistics across age, gender, and location than non-Māori, with the lowest health literacy amongst Māori in the age ranges between 16 - 24, and 50 - 65 (MOH, 2010).

Health literacy also has an impact on children's health outcomes and well-being. Parents and caregivers are routinely required to understand complex health recommendations for preventative care for their children such as genetic and newborn screening, immunisations, and nutritional information (Sanders et al., 2009). Despite the importance of the role of parental decision-making, there has been relatively little research done on health literacy and paediatrics (Aaronson et al., 2019). However, a review by Zaidman-Zait et al. (2018) found a clear link between parental health literacy and health outcomes for children. As parents act as a proxy for children who are too young to make their own health decisions, improving health literacy is essential for parents of children to ensure understanding when making decisions regarding treatment, ensuring informed consent, and following treatment

plans (Aaronson et al., 2018). Three systematic reviews which looked at the relationship between parental health literacy and child outcomes were undertaken by Yin et al. (2007), Sanders et al. (2009) and De Walt and Hink (2009). These reviews all concluded that children whose parents had low levels of health literacy had worse outcomes and poor preventative behaviours, highlighting the importance of improving adult health literacy.

1.3.4 Improving Health Literacy

As a result of the recognition of the impact of poor health literacy on individual health outcomes, improving health literacy has become an international priority. The WHO has maintained that we are in the midst of "a global health literacy crisis" and have accordingly prioritised it as one of the main goals of "Health 2020" (WHO, 2013). National targets and strategies have been developed in countries such as Australia, the United States, China, and some European nations, to focus on improving health literacy within their populations (Nutbeam et al., 2018). These improvements include; effective communication, provision of information, and education, and can be measured by changes to skills and knowledge resulting in different learning and related health outcomes (Nutbeam et al., 2018).

As highlighted earlier, health consumers access information from a variety of sources including verbal information from practitioners, friends, family and media, and written information from reports, pamphlets, and increasingly from the internet (Kelly-Campbell & Manchaiah, 2020). Mitigating the effects of low health literacy involve improving the quality of health communications and information, together with an awareness among health care professionals of the potential impact on populations and individuals (Nutbeam, 2008). Reducing barriers to adequate health and solving the issues around health literacy requires health services to implement strategies that provide a better match between the skills of the adult and the expectations and processes of the health system (Rudd, 2010). One such

strategy involves the development and accessibility of well-written, and comprehensive patient health materials. Appropriately designed health materials can contribute to improving patient self-efficacy and the ability of an individual to self-manage their health (Rudd, 2010).

1.3.5 Self-efficacy

Self-efficacy has been defined as the belief of an individual that they are capable of performing a particular behaviour successfully (Bandura, 1997). Because it is based on the confidence that an individual has in their capability to achieve a *specific* goal or behaviour, self-efficacy is context or domain specific (Smith & Fagelson, 2011). For example, a person may have high self-efficacy within a healthy diet context, but may exhibit low self-efficacy within the domain of public speaking. In this respect, self-efficacy is a distinct construct from general self-confidence, self-worth, or future expectations (Smith & Fagelson, 2011).

Within healthcare it has been evidenced that high self-efficacy is important for successful treatment outcomes, and self-management of health conditions (Bandura, 1997). This entails individuals possessing perseverance, increased efforts, and setting high goals (Bandura, 1997). Gomez and Ferguson (2020) posit that increasing knowledge and self-efficacy can lead to action, however Kawaguchi et al. (2019) caution that self-efficacy must be differentiated from outcome expectancy. That said, interventions based on self-efficacy have been shown to result in better health outcomes than health management treatments which are not (Smith & West, 2006). For example, several studies have suggested that high levels of self-efficacy in hearing aid users may correlate with increased wear time and higher levels of satisfaction (Hickson et al., 2014; Jilla et al., 2020; Kelly-Campbell & McMillan, 2015; Smith & West, 2006). It follows therefore, that high levels of parental self-efficacy could contribute to positive outcomes for their children. Indeed, parents who display low self-efficacy are less likely to engage in, or adhere to, treatments regarding their child's speech

and language development, amplification or recommended management strategies (Desjardin, 2005; Zaidman-Zait et al., 2018).

The compounding effects of low health literacy and low readability and suitability of health education materials contributes to low self-efficacy (McMullan et al., 2018). Self-efficacy may therefore be ameliorated through the provision of patient education materials that are well-designed, easy to read and high quality. Factors such as readability, suitability, understandability, and actionability provide the cornerstones of appropriate health care materials which promote improved health literacy and self-efficacy (Kelly-Campbell & Manchaiah, 2020).

1.4 Readability

1.4.1 Definition of Readability

One of the most fundamental concepts within health literacy is reading comprehension, or readability, of written health material (Kelly-Campbell & Manchaiah, 2020). Readability has been defined as: the ability to read and comprehend written text with ease (Freda, 2005). It encompasses the ability to read fluently, interpret meaning, grasp concepts, seek help with uncommon words, and persevere (Doak et al., 1996). Because positive health outcomes rely on adequate health literacy, it follows that patient health materials need to be written in such a way that promotes understanding (Stossel et al., 2012). Consequently, matching patient's literacy levels to readability levels of health materials contributes to improved health literacy, and the subsequent ability to successfully promote and maintain their own health (Crossley et al., 2017). Conversely, health materials written at a level which is difficult to comprehend, cause readers with poor levels of health literacy to skip over words, take words literally, and miss meaning and context (Doak et al., 1996).

Readability is commonly reported using a reading grade level (RGL). This level is determined by the number of years of education a person has completed and is based on the US education system. The RGL of a written text is suggested to correlate to the difficulty of the text determined by the grade level at which the average reader would be able to understand it (Wong & Levi, 2017). However, drawing conclusions based on years of education is problematic as many adults score at reading levels lower than years of schooling completed (Berkman et al., 2011).

Recommendations for an appropriate RGL for patient health materials to enable adequate comprehension is no higher than the 6th grade (Doak et al., 1996; Friedman & Hoffman-Goetz, 2006), and preferably between the 4th and 6th grade (Wang et al., 2013; Weiss, 2003). Because ethnic minority groups have disproportionate levels of functional literacy contributing to higher rates of morbidity and mortality (Horner et al., 2000), the recommended RGL for at risk populations are likely to be lower. Despite this, patient information materials are consistently written at higher levels than the average person is able to comprehend (Freda, 2005; McInnes & Haglund, 2011).

1.4.2 Readability Formulas

Within the healthcare environment, readability formulas are frequently used to measure the understandability of written information and guide the development of patient health materials (Ley & Florio, 1996; Wang et al., 2013). More than 200 readability tools have been devised based on multiple regression equations most of which predict reading ability based on syntactic complexity, and lexical sophistication (Crossley et al., 2017; Ley & Florio, 1996). These formulas which are commonly now found in most computer software packages, provide a numeric value which is intended to reflect comprehension of a text (McInnes & Haglund, 2011). Common features involve average word and sentence length,

and number of complex and monosyllabic words (Ley & Florio, 1996). Because there is considerable variability in the application of processing algorithms of each formula, the results can complicate interpretation of the estimated RGL (Wang et al., 2013). It is therefore recommended to use more than one formula when calculating a RGL (Friedman & Hoeffman-Goetz, 2006; Klingbeil et al., 1995). Despite some limitations, and although a RGL does not ensure comprehension by itself, it does provide a useful estimate (Kelly-Campbell & Manchaiah, 2020).

The current study employed three validated readability formulas which have been used extensively in health research: Flesch-Kincaid (F-K), Gunning Fog Index (FOG), and Simple Measure of Gobbledygook (SMOG). These three tools provide an estimated score related to RGL and closely correlate with each other (McInnes & Haglund, 2011).

1.4.2.1 Flesch-Kincaid grade level

The F-K (Kincaid, Fishburne, Rogers & Chissom, 1975) is a quick, convenient, and easy to administer tool available in software programs such as Microsoft word. It requires three 100 word passages and provides computational analysis based on sentence and word length (Friedman & Hoffman-Goetz, 2006). The following formula is used to calculate the F-K:

$$Grade = 0.39 \times \left(\frac{words}{sentences}\right) + 11.8 \times \left(\frac{syllables}{words}\right) - 15.59$$

1.4.2.2 Simple Measure of Gobbledygook

Unlike the F-K, the SMOG formula (McLaughlin, 1969) is based on 100% comprehension and as such is highly recommended for use over other formulas (Klingbeil et al., 1995). Calculations are based on the number of polysyllabic words in a 30 sentence

passage with 10 sentences taken from the beginning, middle and end of the passage (Friedman & Hoffman-Goetz, 2006). SMOG generates a RGL between the 3rd and 19th grade, although may be less accurate at levels lower than 6 (D'Alessandro et al., 2001). SMOG scores are generally higher than RGLs given by other formulas, in some cases up to 2 or 3 grades higher (DuBay, 2004; Freda, 2005). The SMOG is calculated using the following formula:

$$Grade = 1.0430\sqrt{number\ of\ polysyllables \times \frac{30}{number\ of\ sentences}} + 3.1291$$

1.4.2.3 Gunning Fog Index

Comprehension for the FOG (Gunning, 1973) is set between the F-K (75%) and the SMOG (100%) at 90% (Wang et al., 2013). Its calculation is based on the average number of words per sentence, and the percentage of words which are more than 3 syllables in length and is assessed on a passage of 100 words (Friedman & Hoffman-Goetz, 2006; Ley & Florio 1996). The following formula is used to calculate the FOG:

$$Grade = 0.4\left[\left(\frac{words}{sentences}\right) + 100\left(\frac{complex\ words}{words}\right)\right]$$

1.4.3 Readability in Audiology

A substantial body of evidence across a vast range of health disciplines have concluded that the majority of patient health materials have been written at a RGL exceeding the recommendations for effective comprehension (Bennett et al., 2012; Bhandari, 2010; D'Alessandro et al., 2001; Klingbeil et al., 1995; Paasche-Orlow et al., 2003). Similar to the existing research, a considerable portion of patient education materials within audiology have

also been shown to exceed the recommended RGL (Caposecco et al., 2014; Donald & Kelly-Campbell, 2016; Joubert & Githinji, 2013; Laplante-Lévesque et al., 2012).

Using the F-K, Fry and FOG formulas, Caposecco et al. (2014) evaluated 36 hearing aid user guides (HAUG) from different manufacturers. They calculated the mean RGLs of the guides to be 9.6, a level considered far too high for older adults in particular. In 2012, Laplante-Lévesque et al. evaluated the readability and quality of information for individuals with HL and their communication partners from 66 websites on the internet. Using Flesch Reading Ease (FRE), F-K, and SMOG the authors found that only those with 11-12 years of education were likely to understand the information, and suggested recommendations for improvement. A systematic review undertaken by Laplante-Levesque and Thoren (2015) assessed the readability of internet information available to people with hearing impairment and their communication partners. Their findings reported mean readability levels within 9-14, meaning that only those readers with 9 to 14 years of education to read and understand these resources.

As patient education materials are also targeted toward parents of children it is essential that comprehension needs are met in order to facilitate appropriate decision making and care for their children. A substantial number of these studies follow a similar pattern by demonstrating unacceptable levels of readability (Freda, 2005; Joubert & Gilthinji, 2013; Klingbeil et al., 1995; Wong & Levi, 2017). In 1995, Klingbeil, et al. evaluated 33 paediatric education materials on a number of health topics provided by 5 paediatric practices. Using Fry, FOG and SMOG, they found that the majority of the pamphlets had a RGL of more than 9. In a similar study in 2005, Freda assessed 74 paediatric patient brochures distributed by the American Academy of Paediatrics using SMOG and F-K. Freda's results showed that at least 50% were written at a higher than recommended level, stating however, that had the SMOG

alone been used, all the brochures RGLs would have been unacceptably high, highlighting the necessity for the use of more than one formula (Freda, 2005).

In 2013, Joubert and Githinji undertook a study looking at the availability, readability and quality of information pamphlets given to parents of children regarding hearing and HL in South African hospitals. As reading grade levels in South Africa, as a developing nation, have been recommended to be 4 or lower for ease of understanding, the study found that 95% surpassed this recommendation, with materials ranging between 4 - 11 RGLs. It is important however to note that the authors used only the SMOG formula in their calculations. Wong and Levi (2017) assessed 502 paediatric articles sourced from online health libraries in the USA. Using 6 readability formulas, they ascertained that the majority (71.7%) were written at a level too difficult for the average reader to comprehend. Prieto et al., undertook a similar study of online health resources relating to paediatric surgery in 2019. Of the 195 resources assessed, 98% were found to be above the recommended RGL. This is particularly concerning given how popular online health information has now become. Moreover, if parents are unable to comprehend information provided by their health care practitioner, they are more likely to turn to the internet as an alternative source (Laplante-Levesque & Thoren, 2015).

1.5 Suitability

1.5.1 Definition of Suitability

The suitability of a written text refers to the level of appropriateness for its intended recipients. Specifically, it is a prediction of how easily materials can be read and understood by populations accessing healthcare, particularly those with low health literacy (Kelly-Campbell & Manchaiah, 2020). Addressing the suitability of patient information materials further enhances comprehension by incorporating strategies which can increase ease of

reading (Horner et al., 2000). It has been established that even readers with adequate levels of literacy prefer easy-to-read materials with reported benefits such as decreased reading time and greater understanding (Davis et al., 1994). Factors that may affect how well a written text will be understood are: layout, spacing, colour, diagrams, topography, illustrations, sentence length, jargon, polysyllabic words, and legibility (Bennett et al., 2012). Health materials that are well designed and easy to understand contribute to patient self-efficacy (Doak et al., 1996).

1.5.2 Assessing Suitability

Assessing the suitability of patient health materials together with readability further contributes to improving health literacy. A common tool for the measurement of the suitability in health materials is the Suitability Assessment of Materials (SAM) instrument developed by Doak et al., in 1996. This is a validated assessment tool which covers 22 criteria grouped under 6 broad categories: (1) Content, (2) Literacy demand, (3) Illustrations and Graphics, (4) Layout and Typography, (5) Learning stimulation and motivation, and (6) Cultural appropriateness. A superior rating of the material is 70 - 100%, an adequate, 40 - 69%, and not suitable less than 39%. It is important to note that although RGL is a component within the SAM measurement, a material can be assessed as 'adequate' even with a RGL higher than the recommended level (McCormack et al., 2010). This highlights the importance of using both readability and suitability measures when producing, evaluating and revising patient education materials.

1.5.3 Suitability in Audiology

Similar to readability, suitability has been researched more extensively in other health disciplines than in audiology. Outcomes from studies using SAM as a measure of suitability

report that the majority of materials are rated to be either ‘adequate’ or ‘not suitable’ (Nasser et al., 2012; Shieh and Hosei, 2008; Smith et al., 2013; Weintraub et al., 2004; Yin et al., 2013). Very few examples of studies using SAM as a gauge for suitability of health materials currently exist within audiology.

In Caposecco et al’s (2014) study previously described, in addition to readability measures, the authors also assessed the suitability of the HAUGs, finding 69% ‘not suitable’ and 31% ‘adequate’ when measured using SAM, further concluding that the materials were not optimal for the recipients, and may restrict the chances of successful outcomes for hearing aid use. Ming and Kelly-Campbell used SAM to assess and revise a tinnitus brochure in 2018. The brochure was assessed to have a SAM score of 38%, equating to a ‘not suitable’ rating. In a similar study in 2018, McMullan et al. assessed and revised a HAUG. The authors evaluated the original SAM score to be not suitable (28.95%). Clearly more research is required to be carried out to determine the suitability of patient education materials in audiology. However, the evidence thus far, lends itself to concluding that there are significant improvements required in order to provide patients with education materials which are appropriate in terms of both readability and suitability and their subsequent contribution to self-efficacy.

1.6 Best Practice

Best practice refers to employing a method to ensure that written health materials are effective and appropriate for the target audience. (Doak et al., 1996). Given the evidence discussed, it is clear that currently most health materials require improvement to facilitate increased accessibility, comprehension and subsequent self-efficacy. Because there is a mismatch in the language, logic and experiences of patients and the health professionals who

create patient education materials, it is imperative that tools designed for effective writing be utilised (Doak et al., 1996).

Writing appropriate patient education materials and revising existing materials can be achieved using the same tools. There have been several methods proposed for achieving this aim (McGee, 2010; MOH, 2012). Elements which take into account reading comprehension, quality, suitability, understandability, and actionability are essential for the development of appropriate health materials, and incorporating tools such as SAM, Plain Language, and RGL should be used to facilitate this (Kelly-Campbell & Manchaiah, 2020). Doak et al. (1996) proposed guidelines for writing suitable health materials "Teaching Patients with Low Literacy Skills" by providing step by step instructions with the implementation of such tools.

1.6.1 Revision of patient materials

Improving health materials may be guided by the principals demonstrated by Doak et al. The authors set out 3 main stages: (1) Planning, (2) Writing and production, and (3) Testing. A full review of the of these principles are displayed in Appendix A.

1.6.2 Outcomes of Revision of Materials

A vast amount of research has shown that the majority of health materials need improving. Over the last decade studies have begun to emerge showing the benefits gained from document revision. Although limited, studies in the field of audiology are showing promising results, highlighting the need for attention in this endeavor. Pothier et al (2008) revised 20 pamphlets routinely distributed in speech and language therapy departments across the United Kingdom. The authors used the National Health Service toolkit for producing health information and although only measures of readability were used to report outcomes, the revised documents showed significantly better readability than the originals. However,

because readability is only one component for improving health literacy, it is important that revisions implement and verify both readability and suitability based on best practice guidelines. This understanding has resulted in more recent studies focusing on both components.

In 2016, Donald and Kelly-Campbell used a mock paediatric report the likes of which is sent out to parents of children who are diagnosed with HL. In their study the report was initially shown to have a readability grade of 15.4. The report was subsequently revised using a combination of parental feedback and best practice guidelines. Some of the improvements included: inclusion of graphics to enhance learning, reduction of sentence length and passive voice, substitution of jargon for more commonly used words, and provision of examples. Learner verification was carried out by randomly grouping participants into an unrevised report and a revised report cohort, and comparison of comprehension and self-efficacy measures, and gauging opinions. Measures of comprehension, self-efficacy and opinion scores showed significant improvement for the revised group, and the revised RGL at 6.9 showed a marked improvement.

Revision of a HAUG was undertaken in a pilot study in 2018 by McMullan et al. aimed at investigating whether the outcome was associated with improved usage and hearing aid self-efficacy. Assessment of the HAUG was carried out using measures of readability and suitability, and revised using best practice guidelines to improve these measures. In addition, the authors produced a video version of the HAUG to enhance hearing aid self-efficacy. RGLs were improved from an average of 12.2 down to 5.5, and SAM ratings increased from ‘not suitable’ to ‘superior’. Based on recommendations from the literature, the authors increased the font size to 16, used short sentences, section, chunking, and minimalized and explained jargon, added a summary and removed unnecessary information, used line drawings and black ink on white background, added a glossary, and reduced passive

sentences. The results showed that self-efficacy and utility performance were significantly higher when the revised material was used, particularly with the use of video modelling. Ming and Kelly-Campbell (2018) revised a tinnitus brochure commonly given out to clients who attended a private clinic. The authors evaluation of the original brochure resulted in a RGL of 10.5 and a suitability score of 'not suitable'. By employing a combination of best practice guidelines and participant feedback to guide the revision, the revised brochure's RGL was lowered to 5.9, and suitability was increased to 'superior'. Some of the improvements included increasing font size, replacing jargon, use of bulleted lists, removal of extraneous content, and addition of a 'practical tips' section. Based on these outcomes, the authors concluded that the revision resulted in improved readability, comprehension, and self-efficacy for patients afflicted with tinnitus. These studies highlight the benefits to patient's self-efficacy when written materials are both readable and suitable, indicating that more work needs to be done to provide this.

1.7 Study Rationale

MHL is the most common of all degrees of HL in children. Despite the documented adverse effects of MHL on children, guidelines for intervention are lacking, resulting in parental decisions regarding intervention for these children being complex. It is therefore imperative that parents have the knowledge required to guide their decision making. However, a large number of studies have concluded that most patient information materials are written at a level which is too high for the average adult to understand. This is particularly concerning for those members of the target audience who have low health literacy, which includes the majority of New Zealand adults. For indigenous populations such as Māori who are over-represented in both low health literacy statistics and MHL, providing written health

materials that enable comprehension and engagement are crucial to reducing disparities, and the risk of poor outcomes.

The present study endeavours to assess both the readability and suitability of a paediatric MHL brochure using several readability formulas and SAM, and revise it, if indicated, using best practice guidelines. Given that this brochure is commonly given to parents of children with MHL, it is vital that it is comprehendible and suitable for the recipients. This is clinically relevant as parents who achieve self-efficacy through understanding, are better equipped to make shared decisions which promote good outcomes for their children.

1.8 Aims and Hypotheses

The aims of the present study are to evaluate, revise, and assess learner verification of a paediatric MHL brochure with the goal of providing a resource which is easily comprehendible by the majority of the population for which it is intended. To address the first aim, the readability of the brochure will be evaluated using readability formulas; F-K, SMOG, and FOG to attain a RGL average. SAM will then be used to assess the suitability. The second aim will be accomplished by using best practice guidelines for revision of the brochure. Following the revision, learner verification will be tested by surveying members of the target audience to ascertain the outcomes and test the hypotheses.

The following research questions have been posed to address the aims of this study:

1. What is the RGL of the paediatric mild hearing loss brochure that is commonly provided to parents of children at an audiology clinic?
2. What is the suitability of the paediatric mild hearing loss brochure that is commonly provided to parents of children at an audiology clinic?

3. Can the revision of the paediatric mild hearing loss brochure confer significant advantages to the parents of children in terms of:

    Readability

    Comprehension

    Self-efficacy

    Preferences

The following hypotheses address the aims of the study:

Hypothesis 1: The original brochure will have a readability level exceeding the 6th RGL.

Hypothesis 2: The original brochure will have a SAM score less than 70%.

Hypothesis 3: The revised brochure will have a readability level of no more than the fifth RGL.

Hypothesis 4: The revised brochure will have a SAM score greater than 70%.

Hypothesis 5: The participants will determine that the revised brochure significantly improves comprehension, self-efficacy, and preferences when compared to the original.

Chapter 2: Method

2.1 Overview

The aims of this thesis were to (1) evaluate, (2) revise, and (3) verify a paediatric mild hearing loss brochure. To address the first aim the brochure was evaluated using standardised measures to determine readability and suitability. To address the second aim the brochure was revised using best practice guidelines to achieve an acceptable level of readability and suitability. The third aim was addressed by undertaking a process of learner verification whereby naïve members of the target audience were recruited to answer questions for either the original or the revised version of the brochure in an online Qualtrics survey. These questions were designed to assess measures of comprehension, preference, and self-efficacy. The goal of the study was to make improvements to the original brochure in order to convey enhanced readability, suitability and subsequent self-efficacy. Ethical approval for this study was granted by the University of Canterbury Human Ethics Committee on the 14th February 2020 (Appendix B). All individuals provided consent prior to participating in the study.

2.2 Paediatric Mild Hearing Loss Brochure

The paediatric mild hearing loss brochure (Appendix C) entitled ‘What is mild hearing loss?’ is a resource which is given to parents of children who have been diagnosed with a MHL throughout New Zealand. Usually this is in a DHB setting, however some private clinics also test children’s hearing and will have access to this resource. The brochure is produced and distributed by the NSU and is also available on their website as a pdf document. Permission was granted by the NSU to reproduce this brochure and publish it in this thesis. Given this resource is widely used, it has been chosen as revision of it may have important clinical applications.

2.2.1 Readability Analysis of Brochure

Readability analysis was undertaken using the website https://www.webfx.com/tools/read-able/. This website uses six readability formulas: FRE, F-K, FOG, SMOG, Coleman Liau Index, and Automated Readability Index, and calculates an average RGL based on these. The text from each brochure was copied and pasted into the text bar which then generated a report showing readability indices for each of the formulas. The resource also produces a list of text statistics outlining the number of sentences, number of words, number of complex words, percentage of complex words, average words per sentence, and average syllables per word. This study used three formulas derived from the resource: F-K, SMOG, and FOG which generate a RGL. The revised brochure was evaluated using the same process.

2.2.2 Suitability Analysis of Brochure

Analysis of suitability of the brochure was achieved using the SAM tool as discussed in chapter 1.5.2. Each of the 22 factors have a rating from 0 - 2 relating to not suitable (0), adequate (1), and superior (2), culminating in an overall score out of 44 which is then converted to a percentage score. If an item was not applicable to the material it was omitted from the calculations. For example, health material designed for readers from a wide range of cultures would not be rated for 'cultural appropriateness', therefore this category would be excluded from the evaluation (Caposecco et al., 2014).

Each criterion was rated and scored by the author with a final score calculated and a rating derived. Once completed, the revised brochure underwent the same process. One of the SAM subcategories was removed from the assessment ('list, tables etc. explained') as the graph had been removed from the original material, and the revised material no longer contained any graphs or tables which needed explanation. Therefore, the maximum SAM score was revised down to 34. To establish the reliability of the ratings, a newly graduated

audiologist, and a student audiologist, independently evaluated the revised brochure using the SAM tool, reporting both scores and ratings.

2.2.3 Revision

Results from SAM, RGL, best practice guidelines, and recommendations from professional review were used to guide revision of the brochure. The revised brochure can be found in Appendix D. Using a standard method for improving readability as discussed in chapter 1.4.2, appropriate readability was achieved by reducing sentence and word length. Specifically, long sentences were replaced either by a shorter sentence, 2 shorter sentences or bullet points. Complex words were replaced by simpler words and polysyllabic words by mono or bi-syllabic. Given that much of the original brochure was written in active voice, only a few amendments were needed to increase the use of active voice, thus improving the already present conversational tone and ease of reading. To address suitability, changes were made to the literacy demand, graphics, layout and typography, and learning stimulation and motivation. A summary of the final changes can be found in Table 1.

2.2.4 Professional Review of Revision

The supervisor of this study reviewed the revision and made suggestions for amendments which were implemented. A veracity check by a paediatric audiologist was then undertaken in order to maintain accuracy of the content, and to ensure that the revised version did not result in the exclusion of important information. The audiologist has 37 years of experience working with children with HL. Alterations to the revision were made based on his input and suggested changes. Following these changes, the revision was assessed by one newly graduated audiologist, and one student audiologist. No further suggestions were made. The final revised brochure was then confirmed as appropriate by all review participants.

Table 1

Summary of changes made to the original brochure

SAM categories	Revision
Content	Changed title to 'What does mild hearing loss mean for my child' to more accurately convey the purpose. Added 'where can I get more help?' section to help guide desirable reader behaviour. Changed 'birds singing' to 'a small bird chirping' as some birds are quite loud. Changed 'your child's needs ***may*** change' to '***will*** change'. Added information about contacting your audiologist if your child wears hearing aids and their hearing worsens when they have an ear infection.
Literacy demand	Increased bullet points, reduced sentence and subheading length and replaced complex words with common words eg. 'think' rather than 'suspect', 'gets worse' rather 'deterioration'. Increased the use of active voice eg. 'your child' rather than 'children'. Removed unnecessary jargon such as; 'decibels', and changed otolaryngologist and paediatrician to common explicit words eg. doctors. Included use of imagery words such as 'fish' for 'f', and examples of soft sounds included such as 'leaves rustling' and speech sounds such as 'mihi', and 'ka pai' (Te Reo Māori words).

	Value judgement words removed eg. ‘slightly below normal’ was replaced with an explanation of MHL and examples of soft sounds.
Graphics	Removed picture of audiogram as deemed to be cluttered, confusing, difficult to understand, and unnecessary, as well as description of same. Replaced with a picture of an adult talking to a toddler demonstrating desirable communication behaviours such as facing, looking at the child, and being close. This was deemed more relevant to the content and ‘normalised the HL experience. Added caption: ‘talking to your child’ to tell the reader what the image is about. Added a picture of a fantail beside the explanation of the sounds that your child may not hear (‘a small bird chirping’) to provide imagery and meaning. This is a familiar and recognisable image for most New Zealanders
Layout & Typography	Changed from columns to full page to enable ease of reading. Increased spacing of text. Increased font size to 12. Changed to white background to reduce reader fatigue. Switched sequence content ‘what happens as my child grows up’ and ‘will my child need hearing aids’ for more logical flow. Added separate section for information on ear infections to make smaller chunk.
Learning Stimulation	Added explanation of difficult terminology such as ‘ear infection’ by adding a list of signs to watch for ear infections eg. “your child is

	pulling at their ear", to enhance specific terms and make concepts familiar. Extra information was added to enhance learning eg. "think about what it is like for you when you wear ears plugs", and "if your child can't hear a word, they won't be able to say it". Further desirable behaviours added such as: "ask for information that you can pass on to the day care or school". Websites were updated and NSU website was included for access to further information.

2.3 Participants

2.3.1 Recruitment

A sample size of 48 participants (24 in each group) was deemed necessary to recruit based on *a priori* G* Power analysis to detect a partial eta squared of 0.5 (power = 0.8, alpha = 0.05). Participants were recruited over a six-week time frame using a combination of purposive and convenience sampling. A recruitment flyer was sent out via email to five umbrella kindergarten (pre-school centres for 3-5 year olds) regions (Wellington, Hamilton, Christchurch, Taupō, and Rotorua) with a request to share the email and online survey link to their kindergarten members and subsequent parent members. Emails were also sent directly to seven kindergartens in the Palmerston North region in a range of socioeconomic locations. The flyer contained information about the study aim, details of inclusion criteria, survey link, contact details, and inducement offer. It was intended that the participants were sourced from a range of socioeconomic locations in New Zealand, to enable a relative representation of the population of interest. Recruitment coincided with the height of the Covid-19 outbreak in New Zealand, and kindergartens were closed at this time. After four weeks recruitment had

stalled at 15 respondents, therefore a further 10 emails were sent out to kindergartens in Te Puke, Ngongotaha, Kamo, Patea, Kerikeri, Whangarei and Gisborne. With no further responses received within another two weeks due to time constraints a request was made to share the survey link on the authors personal Facebook page. Due to a rapid influx, the number of complete responses reached 70, which was in excess of the required 48. The survey was therefore immediately closed.

2.3.2 Inclusion and exclusion criteria

The inclusion criteria was based on gaining a sample of people representative of the target audience for which the brochure is intended. Participants were therefore required to meet the following criteria:

1. Over the age of 18
2. Able to read in English
3. Caregivers of at least one child between the ages of 0-5 years
4. No prior experience with audiological services

Rationale for the first inclusion criteria was determined by the age of parents in New Zealand. Statistics New Zealand - Tatauranga Aotearoa reports the median age of mothers in 2018 was 30.5 years, and fathers 32.4 years. The percentage of births to mothers under the age of 19 years was reported to be 4% in 2016 which was used to determine the lower age limit used in the study. The second criteria ensured that all participants were capable of reading the report and completing the questions in the survey. The third criteria was determined based on the average age of identification of a MHL in children in New Zealand encompassing both early and late identification. The fourth criteria reflected the fact that most children diagnosed with a HL have parents with normal hearing, and thus have no prior experience of HL or audiological services.

2.4 Procedures

Participants who chose to complete the online survey followed the link to open the survey. The first section of the survey contained information regarding the survey, confidentiality, withdrawal, storage and destruction of data, method for obtaining the results of the study, avenue for complaints, and contact details of the researcher and supervisor. The participants were informed that by clicking 'agree' they were consenting to the use of their responses in the study. The second part of the survey contained instructions for completing the survey. Specifically, the instructions explained that the participants would first answer some questions about themselves, then they would be asked to click on a link which would open one of the brochures in a new tab online. They would then be required to return to the survey and answer questions about their understanding of the content in the brochure, and their opinions about various aspects of it. They were also told that at the end of the survey, there would be the opportunity to enter a draw to win one of two $50 prezzy cards (vouchers), and that they would be redirected to another survey to add their name and contact details to ensure anonymity of their survey responses.

The original and revised brochures were converted to web pages using Wix website builder at www.wix.com, and the uniform resource locators (URL) of each were added to the survey then randomised so that each participant completing the survey would randomly be given access to either the original or the revised version. The participants were required to read the online brochure and once they returned to the survey a series of questions were to be completed. Once the survey was closed analysis of the data collected was undertaken.

2.5 Measures

Comparison of the original and the revised version of the brochure was achieved by collecting both qualitative and qualitative data using measures of demographic data, comprehension testing, and subjective questionnaires.

2.5.1 Demographic Questionnaire

Information about the participants was collected via the online survey relating to four demographic variables: gender, age, ethnicity, and highest academic qualification (Appendix E).

2.5.2 Comprehension Test

Comprehension of the content in the brochure was assessed by the use of 6 multiple choice questions (Appendix F). The questions were developed using a template accessed from Donald and Kelly-Campbell (2016). These questions were adapted to reflect the content of the brochure in the current study.

2.5.3 Subjective Questionnaire

Self-efficacy and preferences were both assessed by way of questionnaires (Appendix F). The self-efficacy questions were aimed at assessing whether the participants felt confident in their understanding of the terms, information, and recommendations contained in the brochure. Options presented were: not confident, slightly confident, moderately confident, confident, or very confident. Preference measures were assessed by 8 questions: (1) the brochure was what I expected it to be, (2) I found the brochure confusing, (3) the brochure was useful to me, (4) I felt frustrated reading the brochure, (5) the order of the information in the brochure was helpful, (6) I thought the brochure was a good length, (7) I thought the brochure was hard to read without help, and (8) I thought the brochure used too much jargon.

The response options given were: strongly agree, agree, somewhat agree, neither agree nor disagree, somewhat disagree, disagree, strongly disagree. A further option to make any comments on the brochure was given at the end of the survey.

2.6 Data Analyses

The dependent variables in this study were the RGL and SAM, comprehension, self-efficacy and preference rating results. Independent variables were the original and revised material. Statistical analysis of the data was carried out using IBM Statistical Package for the Social Sciences (SPSS) software (version 26). Readability and suitability results of the original and revised version of the brochure, and participant samples were described using descriptive statistics. Comparisons were made between the original version readability and the recommended RGL. Further comparisons were made between the RGLs for the original and the revised versions. SAM scores were also compared. Analysis of Variance (ANOVA) was used to compare the two reports along the three outcome variables (comprehension score, self-efficacy, and preferences). Themes were derived from the comments received from the participants of the survey to gage subjective opinions.

Chapter 3: Results

3.1 Overview

The following research questions are addressed in this chapter:

4. What is the RGL of the paediatric mild hearing loss brochure that is provided to parents of children at an audiology clinic?
5. What is the suitability of the paediatric mild hearing loss brochure that is provided to parents of children at an audiology clinic?
6. Can the revision of the paediatric mild hearing loss brochure confer significant advantages to the parents of children in terms of:

    Readability

    Comprehension

    Self-efficacy

    Preferences

3.2 Results of Evaluation

3.2.1 Readability and Suitability Assessment

The following hypotheses are addressed in this section:

Hypothesis 1: The original brochure will have a readability level exceeding the 6th RGL

Hypothesis 2: The original brochure will have a SAM score less than 70%

3.2.1.1 Readability of Original Brochure

Evaluation of the readability of the original brochure revealed that it was written at a RGL higher than the recommended 6th grade. The evaluation was determined using the three readability formulas described in chapter one; F-K, SMOG, and FOG. These results revealed

that the brochure was written at a level approximately 3 grades above the recommended RGL, therefore supporting hypothesis 1.

3.2.1.2 Suitability of Original Brochure

Evaluation of the suitability of the original brochure was scored using the SAM. The SAM assessment revealed an 'adequate' rating. These results indicate that the original brochure could be improved in terms of suitability for patient education. These findings therefore support hypothesis 2.

3.3 Results of Revision

3.3.1 Readability and Suitability Assessment

The following hypotheses are addressed in the below sections:

Hypothesis 3: The revised brochure will have a readability level of no more than the 5th RGL.

Hypothesis 4: The revised brochure will have a SAM score greater than 70%.

3.3.1.1 Readability of Revised Brochure

Evaluation of the readability of the revised brochure revealed that it was written at a RGL lower than the recommended 6th grade. The evaluation was again determined using the three readability formulas described in chapter one; F-K, SMOG, and FOG. These results revealed that the brochure was written at a level approximately 1.5 grades below the recommended RGL. These results support hypothesis 3. A summary of the readability analysis results for the original and revised versions of the brochure is shown in Table 2.

Table 2

Readability analysis of original and revised brochure RGLs

Version	F-K	SMOG	FOG	Mean
Original	7.8	7.9	10.3	8.7
Revised	3.3	4.5	5.8	4.5

As discussed in chapter 2, the readability software used also produces an analysis of textual features allowing comparison between the original and revised versions shown in Table 3. Although the revised version contained 1 more sentence than the original, all other metrics offered substantial improvements considered to be important for increased readability.

Table 3

Comparisons of textual features between the original and revised brochures.

Text statistic	Original	Revised
Number of sentences	63	64
Number of words	916	688
Number of complex words	113	28
Percent of complex words	12.34%	4.07%
Average words per sentence	14.54	10.75
Average syllables per word	1.5	1.25

3.3.1.2 Suitability of Revised Brochure

Evaluation of the suitability of the revised brochure was scored using the SAM by the author and the two independent external raters described in chapter two. The SAM

assessment revealed a 'superior' rating. A breakdown of the SAM scores is shown in Table 4. The independent raters scored the material 91% and 94%. These results indicate that the original brochure has been improved in terms of suitability for patient education, thus supporting hypothesis 4.

Table 4

SAM score analysis for original and revised brochures

Sam category	Maximum score	Original brochure	Maximum Revised score	Revised brochure
Content	6	4	6	4
Literacy demand	10	6	10	10
Graphics	8	2	6	6
Layout & Typography	6	6	6	6
Learning stimulation	6	4	6	6
Cultural appropriateness	N/A	N/A	N/A	N/A
Total	36	22	34	32
Percentage score	100%	61%	100%	94%

3.4 Results of Verification

The following hypothesis is addressed in the section below:

Hypothesis 5: The participants will determine that the revised brochure significantly improves comprehension, self-efficacy, and preferences when compared to the original.

3.4.1 Participant Characteristics

A total of 70 participants responded to the online survey, all reporting to meet the inclusion criteria. Random assignment of the original and revised versions of the brochures resulted in 37 participants being allocated to the original, and 33 to the revised. No significant differences were expected between the 2 groups in terms of the measured demographic variables (gender, age, ethnicity, and qualification level) due to the random assignment of the versions. This assumption was tested using chi-square tests for gender, ethnicity, and qualification level, and ANOVA for age. Measures of ethnicity were categorised into New Zealand European (NZE), Māori, and Other since no other ethnicity types were selected in the survey. Qualification level was assigned High School (HS), Undergraduate (UG), and Postgraduate (PG), and gender was categorised into Male (M) and Female (F) as no participant selected 'Non-binary'. These analyses revealed no significant differences in the demographic characteristics between the groups as displayed in Table 5.

Table 5

Demographic variables for participants assigned to read the original or revised brochure.

Variable	Original brochure	Revised brochure	χ_2 or F	df	p (2-tailed)
Gender	M 2 F 35	M 1 F 32	0.24	1	.401
Ethnicity	NZE 23 Māori 3 Other 7	NZE 26 Māori 2 Other 5	0.33	2	.108
Qualification	HS 8 UG 21 PG 8	HS 8 UG 14 PG 11	1.65	2	.116
Age	M = 35.62 SD = 6.52	M = 34.88 SD = 6.37	0.24	1,68	.630

3.4.2 ANOVA

3.4.2.1 Examining ANOVA Assumptions

To test hypothesis 5, a series of one-way ANOVAs were performed. Prior to analyses, assumptions of homogeneity of variance, normality, and independence of observation were assessed. Due to the large sample size in each group (N = 33, N = 37), central limit theorem (CLT) applied, therefore normal distribution can be assumed. No significant outliers were detected in the dataset on inspection of data box plots. These findings determined that assumption of normality was met allowing for parametric testing to be conducted.

3.4.2.2 ANOVA results

A one-way ANOVA was conducted to determine the effect of brochure allocation on comprehension, self-efficacy, and preference. There was no significant effect on comprehension, self-efficacy, or preference. Therefore, the following null hypotheses were supported: there are no significant differences between the revised and original versions as measured against the three outcome variables: (1) comprehension, (2) self-efficacy, and (3) preference. These results are shown in Table 6 and Figure 1.

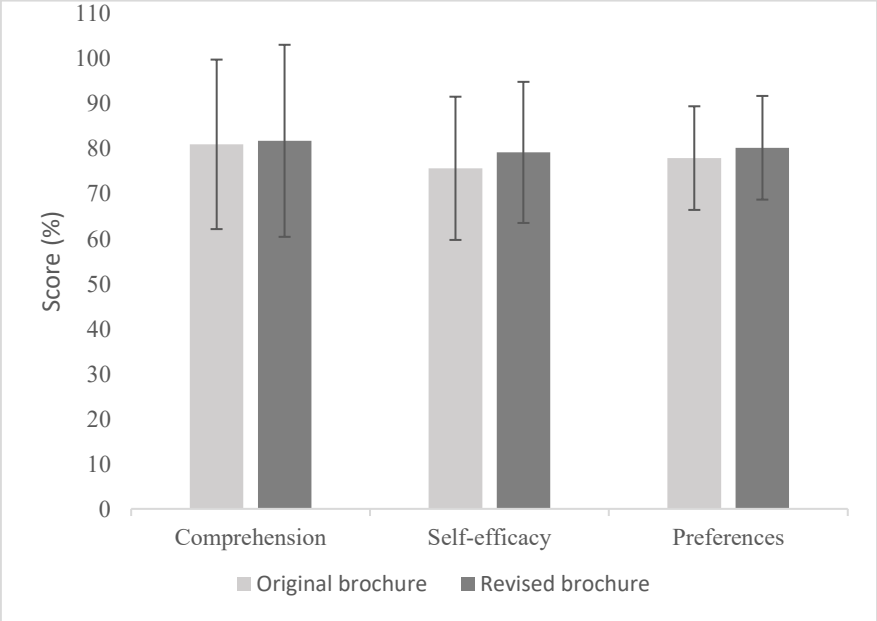
Table 6

Summary table for the results of each one-way ANOVA

Variable	F	Hypothesis df	Error df	P	η_p^2
Comprehension	0.023	1	68	0.879	<.001
Self-efficacy	0.862	1	68	0.356	.013
Preference	0.696	1	68	0.407	.010

Figure 1

Mean comprehension, self-efficacy, and preference scores for original and revised brochures (error bars represent 3 standard errors).



3.4 Participant Feedback

Analysis of the participant comments identified six main themes: (1) Ease of reading, (2) Ease of understanding, (3) Language, (4) Graphics, (5) Meeting expectations, and (6) Layout and design. Evaluation of the first theme (ease of reading) revealed that readers felt the original brochure contained too many words and seemed ‘overwhelming’. In contrast readers of the revised brochure commented that it was ‘easy and very clear to read’. In terms of the second theme (ease of understanding) readers of the original brochure described it as easy to understand but potentially overwhelming for parents in this situation and needing more visuals to aid understanding. Comments for the revised brochure for this theme included clear and easy to understand, the definition of ‘hearing loss’ was confusing, and confusion around the section ‘helping your child to hear’. Only one comment was made for

the third theme (language) which was praise for the explanation of the term audiologist in the original brochure.

For the fourth theme (graphics), readers of the original brochure commented that they were confused about the graph (audiogram), specifically what it meant and the purpose. Another participant suggested that having more graphics to break up the text would be desirable. The one comment for the revised brochure suggested having more pictures. In terms of the fifth theme, (meeting expectations), participant comments were mixed. Readers of the original brochure found it clear, informative, and helpful, however one reader felt that there was too much information. Comments for the revised brochure included being very informative, and giving sufficient information, however one participant wanted more information in contrast to another who reported they would rather see a simpler refined version as there was too much information.

The layout and design theme revealed that the readers of the original brochure had issues with the wall of text, suggesting this needed to be broken up and made less repetitious. Suggestions for improvement included: use of different colours to separate sections, more bullet points, use of ‘artistic’ lines between sections, and a flowchart. One reader of the revised brochure commented that they liked the formatting and use of spacing, while another felt that the layout and order seemed ‘off’ for a brochure. A full description of the comments is displayed in Table 7.

Table 7

Results of participant feedback for the original and revised brochures: general themes and quotes

Theme	Participant's Quotes	
	Original	**Revised**
Ease of reading	When initially opening the document I was overwhelmed by the amount of words. I can imagine someone who may struggle with words or reading, this may be overwhelming. The amount of information on one page felt overwhelming. Too wordy and boring	Easy to read Very clear to read
Ease of understanding	I found this clear and concise, very easy to read and understand but if I was a parent who had just had their world turned upside down I can see how it could be confusing and overwhelming It's too wordy, if there's a way to make it more visual, it would be easier to understand.	Clear and easy to understand Easy to read and understand The only part I found confusing was the hearing "loss" part. To me that implies that my child's hearing was fine, but has since deteriorated. Yet reading the brochure made it seem as if it was more in relation to hearing issues/difficulties rather than hearing loss. Question about what you can do to help your child to hear I thought all the answers were correct so choosing a false one was difficult
Language	I like the way the brochure clarified technical terms like audiologists	
Graphics	Maybe the graph sounds and information written as well as visual for multiple ways of learning. Example words	Maybe some more pictures

	More graphics to break up text might be more appealing to read for some people I found the graph a bit confusing, I'm not sure what the letters on it meant I was a little confused as to the purpose of the graphic/chart	
Meeting expectations	The brochure was clear and helpful It's very informative Too much information	Very informative Supplied sufficient information Lots of information in this brochure. Be great to see a more refined simpler one given first then move on to move depth information I would like more information
Layout & Design	Could use different colours for the different sections. So you can see each box doesn't connect (or does) to another box The layout got me a bit lost and it seemed repetitious Some type of artistic line between segment may help to break up the wall of text on pages 2,3 and 4 I feel like a flow-chart or similar would help people to understand what the next steps were More bullet points	Well formatted ... I liked the spaces… The layout and order of information seemed off for a brochure

3.5 Summary

The results of the study are summarised as follows:

(1) The readability of the original mild hearing loss brochure scored a mean of 8.7 RGL, exceeding the recommended RGL by approximately 3 reading grade levels.

(2) The suitability of the original mild hearing loss brochure revealed an 'adequate' rating at 61% using the SAM tool, suggesting that improvements were indicated.

(3) The readability of the revised brochure scored a mean of 4.5 RGL, therefore falling within the recommended RGL.

(4) The suitability of the revised brochure was rated at 94% ('superior').

(5) Comparisons of the readability and suitability between the original and revised versions of the brochure revealed that the revised version conferred an improvement in both readability and suitability over the original version.

(6) Analysis of learner verification testing revealed that there were no significant differences between the original and revised versions of the brochure when assessed for comprehension, self-efficacy, and preferences.

(7) Themes based on participant comments revealed that readers of the original brochure had more concerns around ease of reading, ease of understanding, graphics, and layout and content than readers of the revised brochure.

Chapter 4: Discussion

4.1 Overview

The aim of this study was to evaluate the readability and suitability of a paediatric mild hearing loss brochure, and if indicated, revise it in order to improve the readability, comprehension, self-efficacy and preferences of readers. This was achieved using a range of tools: (1) three readability formulas, (2) the SAM tool, (3) best practice guidelines, and (4) an online survey. Evaluation of the original brochure confirmed that it was written at a level above the recommended RGL, and that the suitability fell within the range deemed 'adequate'. The revised brochure was assessed to be written at a RGL lower than the recommended level, and suitability was determined to be 'superior'. Learner verification to ascertain whether revision of the brochure conferred significant benefit to readers in terms of comprehension, self-efficacy, and preferences found no statistically significant difference. This chapter will provide a discussion of the results of the study and relate them to the current literature. Limitations and clinical implications of the study will also be discussed, and future directions will be explored.

4.2 Evaluation

4.2.1 Readability of the Original Brochure

Readability is an important aspect of providing information that is easy to read and understand (Pothier et al., 2008). The readability for the original brochure in this study was found to be above the recommended 6th RGL with a mean RGL of 8.7 using the F-K, SMOG, and FOG readability formulas. These results are consistent with the body of literature which report health materials to be written at a level higher than the recommended level across both audiology (Caposecco et al., 2014; Donald & Kelly-Campbell, 2016; Douglas & Kelly-Campbell, 2018; Joubert & Githinji, 2013; Laplante-Lévesque et al., 2012), and other health

disciplines (Bennett et al., 2012; Bhandari, 2010; D'Alessandro et al., 2001; Friedman & Hoffman-Goetz, 2006).

Doak et al. (1996) suggest that revision of patient health materials is indicated if the assessed RGL is higher than 9. The original brochure's RGL of 8.7, although lower than this and that of many of these published studies, remains above the recommended level. Further, given the over-representation of Māori in both MHL and low levels of health literacy, a RGL of lower than 6 is recommended (Berkham, 2011, Joubert & Githinji, 2013). Using a recommended RGL of 4-5 would result in the original brochure being written approximately 4-5 levels higher than appropriate for this population. With levels of inadequate health literacy being reported at 75-80% for Māori (MOH, 2010), the ability to process and understand health information is diminished for this population. It is therefore clear that reflecting this population in sample selection was imperative for this study.

4.2.2 Suitability of the Original Brochure

Suitability of patient health materials further enhances ease of reading and comprehension, particularly for those with low health literacy (Horner et al., 2000; Kelly-Campbell & Manchaiah, 2020), thereby contributing to self-efficacy (Doak et al., 1996). Self-efficacy has been shown to be improved when suitability of materials are improved (McMullan et al., 2018, Donald & Kelly-Campbell, 2016), and individuals with high self-efficacy have been shown to have better health outcomes and self-management of health conditions (Bandura, 1997; Smith & West, 2006).

The original brochure in the current study was evaluated as being 'adequate' (61%) for patient education when rated using the SAM tool. These results reflect the findings in previous studies, that health materials could be improved in terms of suitability, with the majority of the materials assessed reported as being 'adequate' or 'not suitable' (Nasser et al.,

2012; Shieh and Hosei, 2008; Smith et al., 2013; Weintraub et al., 2003; Yin et al., 2013). Studies evaluating audiology materials, although limited, have reported similar findings (Caposecco et al., 2014; McMullan et al., 2018; Ming & Kelly-Campbell, 2018). These studies highlight the need for improvement in patient health materials given to clients in an audiological setting.

4.3 Revision

Revision of a text which subsequently renders an improvement in RGL and suitability, addresses the mismatch between the level at which health materials are written and the health literacy levels of patients, supports health literacy, and corresponding outcomes. Thus far, studies which have undertaken revision have largely focused on selection of written materials with a relatively high RGL, and low levels of suitability. Donald and Kelly-Campbell (2016), McMullan et al., (2018), and Ming and Kelly-Campbell (2018) all undertook revision studies where the RGLs of selected materials ranged from 10.5 to 15.4, with the latter two studies rated as not suitable using the SAM tool. In contrast to these studies, the RGL of the chosen health material was lower than that of those published, and the suitability was rated higher.

4.3.1 Readability of the Revised Brochure

The mean RGL for the revised brochure was assessed at 4.5. This conferred significant improvements in readability, in essence by over 1.5 grade levels from the recommended 6th RGL. These results were in agreement with previous studies. In the Pothier et al., 2008 study which sought to revise 20 speech and language therapy leaflets, revision conferred marked improvements in RGLs with a mean score of 5.4. Similarly, the revisions undertaken by Donald and Kelly-Campbell (2016), McMullan et al., (2018), and Ming and Kelly-Campbell (2018), produced average RGLs of 6.9, 5.5 and 5.9, respectively. Although

these studies used differing measures of readability, the overall results support the theory that revision of a text can consistently provide improvements in readability.

The revised RGL of 4.5 in this study is also considered to be at a level which is able to convey understanding to the majority of the target population, thereby supporting those with low levels of health literacy and importantly, addressing the inequalities experienced by Māori within healthcare. The revised brochure is therefore expected to support health literacy by ensuring a readability level that provides enhanced comprehension, thereby contributing to positive health outcomes.

4.3.2 Suitability of the revised brochure

The revised brochure achieved a SAM rating of 94% with peer review ratings of 91% and 94%. These scores placed the revised brochure in the 'superior' category. The findings reflect those of the previously discussed studies by McMullan et al., (2018), and Ming and Kelly-Campbell (2018). In these studies, the revisions resulted in an improvement in the suitability rating to superior. In contrast to readability, direct comparisons between these studies and the current study can be made as the SAM tool was used to assess suitability. Donald and Kelly-Campbell (2016) used best practice measures to guide their revision, and participant feedback confirmed improvements to the suitability of the material, however, the SAM tool was not specifically employed to rate the revision. It is clear however, that revision of health materials has the ability to improve suitability for patient education, which in turn contributes to supporting health literacy.

4.4 Learner Verification

This study resulted in findings which were not statistically significant for learner verification, thereby supporting the null hypothesis. In effect, this suggests that the readers of

the revised brochure did not report any differences in terms of comprehension, self-efficacy, and preferences over the readers of the original brochure. Although studies measuring learner verification of revision are limited, these results contrast with results reported in the current literature. In the study by Donald and Kelly-Campbell (2016) previously cited, the authors revision of a mock paediatric report culminated in statistically significant differences on measures of comprehension, self-efficacy, and opinions reporting effect sizes ranging from .456 to .866. Of note in this study, the authors used a combination of parental recommendations and best practice guidelines to assist with revision. This model may have contributed to the larger effect sizes reported. In addition, the authors assessed the original report as having a RGL of 15.4. In contrast to the current study the magnitude of this level would be expected to show greater variation in differences for learner verification.

In a similar study by Ming and Kelly-Campbell (2018), learner verification for an original and a revised tinnitus brochure was assessed using the Cloze procedure for comprehension measures, and a novel questionnaire to measure self-efficacy. Unlike the current study, the authors found a significant difference between the revised and original brochures reporting large effect sizes (Cloze effect size d = 3.8, self-efficacy effect size d = 2.0). A major difference was the use of a focus group method and heavy reliance on participant feedback to guide revision. The RGL of 10.5 more closely aligned with the current study, although the SAM rating was ‘not suitable’.

Comparisons with these studies suggest that the use of participant feedback for revision may be an appropriate addition to the model. Indeed, involving members of the target audience in the revision process has been suggested to improve the suitability of the material (Jones et al., 2011; Vadaparampil & Pal, 2010). This concept is highlighted in the current study. One of the comprehension questions asks whether the child’s hearing is normal. Forty-eight percent of respondents (in an even distribution in both groups) answered

that they thought the answer was true – ‘my child’s hearing is normal’. This misunderstanding clearly demonstrates that this element of the revision was flawed, and may potentially have been ameliorated by reader feedback prior to revision. However, for reader recommendations to be meaningful, a sample reflective of the target population would be essential. Further comparisons to these studies indicate that a higher RGL and SAM rating in the unrevised materials may yield more significant effects.

Although unlikely, due to the current literature to the contrary, it is possible that the null hypothesis is true. It is also important however, to consider that publication bias indicates that studies which support a null hypothesis are rarely published, and it is therefore difficult to compare studies with similar findings. There are several considerations which need to be taken into account when interpreting the validity of the results. It is the author’s view that the most likely reason for the null hypothesis being supported is due to the sample of participants in the study not being representative of the target population. The demographic data from the sample collected does not reflect that of the intended audience. As discussed in chapter one, 39% of reported HL were assigned to Māori children in 2018, in comparison to New Zealand European at 55%, and further that Māori children were more likely to have a MHL (Digby, 2019). These figures are in sharp contrast to the study sample which reported only 7% of respondents identifying as Māori, 70% as New Zealand European, and 23% selecting ‘Other’ for ethnicity.

Given that a child is likely to receive a diagnosis of HL between the ages of 0 and 5 years the mean age at 35.25 years, was comparable to the mean of age of mothers and fathers at birth 31.45 years (Statistics New Zealand - Tatauranga Aotearoa, 2018). However, only 4% of respondents identified as male, with the remaining 96% selecting female for gender. Clearly this shows a mismatch with the general population reported as 49.1% male and 50.9% female (in the absence of diverse data collection currently in New Zealand) (Statistics

New Zealand - Tatauranga Aotearoa, 2018). Perhaps the most significantly contrasting demographic statistic in the study sample is the level of education. Seventy seven percent of respondents reported having either an undergraduate degree (50%), or a postgraduate degree (27%), with the remaining 23% having some form of High School qualification. In the most recently collected data (2017), 26% of people in New Zealand reported having a tertiary level qualification (Bachelors degree or higher), with 19% of those reported having no formal qualification (Ministry of Education, 2020). According to the literature, in order to understand the brochure, readers would need to have completed an average of 8.7 years of education. All participants in the study sample reported to have completed years of education in excess of this, ranging from 11 – 19 years. It would therefore be expected that all readers would be able to comprehend the information given.

A further barrier to sourcing a representative target population revolved around access and time frame constraints. The study was undertaken during a Covid-19 lockdown period which significantly limited access to participants as pre-schools and kindergartens were closed. This meant that the survey needed to be delivered in an online format and sampling was required to be completed via email invitations. The invitations were not received until the re-opening of the childcare facilities, and the response rate was low. As time frames became tight a decision was made to move from purposive sampling, whereby a range of decile locations were specifically targeted, to convenience sampling where the survey was opened up to the general population through Facebook requests. These constraints limited the sample to those who had both access to the internet, and the authors personal contacts who were more likely to have higher qualifications.

4.5 Participant Feedback

Although the results indicated that there were no statistically significant differences in preferences between the original and revised versions of the brochure, results of participant feedback found more favourable responses towards the revised version. Feedback was divided into six main categories: (1) Ease of reading, (2) Ease of understanding, (3) Language, (4) Graphics, (5) Meeting expectations, and (6) Layout and design. The overall theme in all of these categories suggested that the revised version was preferred over the original. However, at times these comments were contradicting, highlighting conflicting views held by different participants. For example, in the revised version, some respondents felt that there was too much information, whereas others commented that there was too little. In contrast, there were some clear commonalities, for example, with regards to the graph in the original version, many commented that they found it confusing. These inconsistencies reflect the challenges in providing materials which suit the preferences of all members of a population. Donald and Kelly-Campbell (2016), and Ming and Kelly-Campbell (2018), reported similar challenges in their studies meaning that compromises were necessary in implementing participant's suggestions.

These findings perhaps re-iterate the suggestion that participant feedback prior to revision may be a more appropriate study design. Moreover, providing comments was voluntary in the survey, indicating that if specifically sought, suggestions may have produced a fuller picture of reader preferences which could be then used to guide revision in a more targeted way.

4.6 Clinical Implications

Parents of children who are newly diagnosed with HL may have limited recall of verbal information due to both the complexity and volume of information received, and the

emotional impact of the diagnosis. Notwithstanding this, verbal recall is considered to be around 50% at best, with much of the recalled information remembered incorrectly (Kessels, 2003). For this reason, it is recommended that verbal information is supplemented with written information. It is therefore imperative that written patient materials promote understanding, particularly given the complex decision making required of parents of children with a MHL. The brochure selected for this study resulted in the findings that this resource is not able to promote understanding for many of its intended recipients when assessed using recommended measures. These findings are reflected in the current literature.

Although the results of this study did not find significant improvements in learner verification for the revised brochure, the findings do lend weight to the current research that health materials are able to be improved in terms of readability and suitability, two major measures that have been shown to confer benefit to health literacy in individuals. This should serve as an indication to health professionals that many education materials are unsuitable for their patients, and revision of such can ameliorate these disparities. Using best practice guidelines to guide revision of health materials is a simple and effective tool to increase the likelihood that patients will attain the information and skills necessary to make considered health decisions which may result in improved outcomes.

In order to support patient understanding, self-efficacy, and whānau-centered care, clinicians should determine whether the written materials they provide are appropriate to achieve this aim by utilising the tools recommended in this study. Best practice guidelines can be used to either revise materials which are found to be inappropriate, or create health resources which support the health literacy of patients.

4.7 Limitations

4.7.1 Limitations of Readability Formulas

As discussed in chapter one, readability formulas are a commonly used tool for assessing the understanding of a text. Although they are considered one of the most useful tools for assessing and writing health materials, they are not without limitation. These limitations revolve around the narrow use of linguistic features required in text comprehension, text cohesion for building knowledge, exclusion of vocabulary, style, layout and grammar, and lack of account of world knowledge (Crossley et al., 2017; Kong & Hu, 2015; McNamara et al., 1996). The F-K for example, has been criticised as underestimating the RGL due to the program recognising decimal numbers, bullet points, and abbreviation stops as a period at the end of a sentence (Friedman & Hoffman-Goetz, 2006). A further suggested weakness of the F-K is that readers are only required to comprehend 75% of the text, and only calculates RGLs between 3 and 12 (D'Alessandro et al., 2001; Wang et al., 2013).

Hyphenated words, and words with suffixes are not counted as syllables in the FOG calculation which has also been suggested as a weakness (Friedman & Hoffman-Goetz, 2006). In addition, readability formulas are unable to determine measures which contribute to understanding and ease of reading such as formatting, use of white space, font, and clear purpose of intended message (Redish, 1981), meaning that RGLs should not be used independently to evaluate the appropriateness of a text. Despite this, readability formulas remain an important component of the overall assessment of patient education materials, however, their use should be supplemented with measures which fill these gaps.

4.7.2 Research Model

A lack of effect (0%, 1%, and 1.3%) was reported for learner verification, confirming statistical power was appropriate for the study. These effect sizes mean that very little of the variance in outcome is accounted for by the revision. There were however, several limitations of the model which may have impacted on the validity of the results. Due to time and resource constraints, an equivalency study was unable to be undertaken to ensure the validity of the comprehension metric used. Similarly, metrics used for assessment of self-efficacy and preferences by questionnaire do not necessarily accurately measures these constructs. In addition, the comprehension questions may have been subject to ceiling effects, whereby the high level of education of the participants resulted in these questions being too easy. Compounding this effect, was the open nature of the test which gave the readers the ability to refer back to the brochure when answering the questions. However, the decision to make the test open was based on a more 'real world' situation whereby caregivers receiving the brochure have the ability to refer back to the resource.

As previously discussed, the online nature of the survey excluded participants without access to the internet or email. This may have also compromised the study sample in terms of reducing access to those in low socioeconomic demographics, thereby contributing to the inability to source a representative sample. A further complication of using an online format involved the need to change the brochure format to a web page. This resulted in some confusion around the participants perceptions of what a brochure should look like versus a web page.

4.8 Future Research

Many written health materials are written at a level which does not support health literacy (Bennett et al., 2012; Bhandari, 2010; Friedman & Hoffman-Goetz, 2006; Joubert &

Githinji, 2013). Due to the paucity of research based on revision of written health materials within audiology, it is recommended that further studies are required to assess whether revision of materials confers significant benefit to individuals. This study has highlighted the pitfalls in designing and undertaking this type of research and these should be used to help design future studies. Of particular note are issues around participant selection bias, and steps to overcome this. Future studies should be prepared to identify a sample that is representative of the intended population by considering methods employed by comparative studies. That is, purposive, or stratified sampling procedures, using targeted approaches, and use of paper surveys or focus groups rather than online. In addition, gathering participant feedback prior to and/or during revision may contribute to producing a resource that is more suitable for the intended audience.

4.9 Conclusion

Optimal health outcomes rely on the ability of health consumers to achieve a level of self-efficacy which enables them to make decisions about their healthcare. A lack of appropriate patient education materials provides a barrier to the patient's ability to be informed and take an active role in decision-making. For parents of children diagnosed with a MHL, understanding both the diagnosis and the impact of the condition is critical to ensuring positive outcomes for their child in terms of psychosocial, emotional, academic, and speech and language development. It is therefore crucial that parent health materials support health literacy.

Results of this study indicate that the readability and suitability of a paediatric MHL brochure given to parents/caregivers in a clinical setting, presents a mismatch between the health literacy of this population and the level at which it is written. This means that the majority of the recipients of this resource are likely to have difficulty reading and

comprehending the material. Although the current study was unable to find significant differences between the original and the revised version in terms of preference, self-efficacy, and comprehension, it is believed that this was due to issues within the model, rather than a true reflection of the hypothesis which is supported by the literature. Health professionals have a responsibility to ensure that the health education materials provided to parents of children with MHL are readable, suitable, and promote understanding. To this effect, existing resources should, if indicated be revised, or new resources be developed which support the health literacy of the intended recipients.

REFERENCES

Aaronson, N. L., Joshua, C. L., & Boss, E. F. (2018). Health literacy in pediatric otolaryngology: A scoping review. *International Journal of Pediatric Otorhinolaryngology, 113*, 252-259. doi:10.1016/j.ijporl.2018.08.013

Aaronson, N. L., Cox, C. T., & Boss, E. F. (2019). Parental health literacy in pediatric otolaryngology: A pilot study. *International Journal of Pediatric Otorhinolaryngology, 125*, 87-91. doi:10.1016/j.ijporl.2019.06.029

American Speech-Language-Hearing Association (ASHA) (2008). *Guidelines for Audiologists Providing Informational and Adjustment Counseling to Families of Infants and Young Children With Hearing Loss Birth to 5 Years of Age*. https://www.asha.org/policy/GL2008-00289/

Antia, A. D., Jones, P. B., Reed, S., & Kreimeyer, K. H. (2009). Academic status and progress of deaf and hard-of-hearing students in general education classrooms. *Journal of Deaf Studies and Deaf Education*, *14*, 294-311. doi:10.1093/deafed/enp009

Arnold, C.L., David, T.C., Frempong, J.O., Humiston, S.G., Kennen, E.M., Lloyd Puryear, M., & Bocchini, A. (2006). Assessment of Newborn Screening Parent Education Materials. *Pediatrics, 117*(5), S320-S325. doi:10.1542/peds.2005-2633L

Bagatto, M. (2020). Audiological considerations for managing mild bilateral or unilateral hearing loss in infants and young children. *Language, Speech & Hearing Services in Schools, 51*(1), 68-73. doi:10.1044/2019_LSHSS-OCHL-19-0025

Bandura, A. (1997). *Self-efficacy: the exercise of control*. W.H. Freeman.

Bennett, D. M., Drane, E., & Gilchrist, A. (2012). Readability of CAMHS clinical letters. *Child and Adolescent Mental Health*, *17*(3), 161-165. doi: 10.1111/j.1475-3588.2011.00624.x

Berkman, N. D., Sheridan, S. L., Donahue, K. E., Halpern, D. J., & Crotty, K. (2011). Low health literacy and health outcomes: An updated systematic review. *Annals of Internal Medicine, 155*(2), 97-107.

Berland, G. K., Elliott, M. N., Morales, L. S., Algazy, J. I., Kravitz, R. L., Broder, M. S., Kanouse, D. E., Munoz, J. A., Puyol, J-A., Lara, M., Watkins, J. E., Yang, H., & McGlynn, E. A. (2001). Health information on the Internet: Accessibility, quality, and readability in English and Spanish. *The Journal of the American Medical Association, 285*(20), 2612-2621. doi:10.1001/jama.285.20.2612

Bess, F. H., Dodd-Murphy, J., Parker, R. A. (1998). Children with minimal sensorineural hearing loss: Prevalence, educational performance, and functional status. *Ear Hear, 19*, 339-354.

Bhandari, N. (2010). Readability – writing letters to patients in plain English. *The Psychiatrist, 34*(10), 454. doi: 10.1192/pb.34.10.454

Boston, M., Ruwe, E., Duggins, A., & Willging, J. P. (2005). Internet use by parents of children undergoing outpatient otolaryngology procedures. *Archives of Otolaryngology-Head & Neck Surgery, 131*(8), 719.

Caposecco, A., Hickson, L., & Meyer, C. (2011). Assembly and insertion of a self-fitting hearing aid: design of effective instruction materials. *Trends in Amplification*, *15*(4), 184-95. doi:10.1177/1084713811430837

Caposecco, A., Hickson, L., & Meyer, C. (2014). Hearing aid user guides: Suitability for older adults. *International Journal of Audiology, 53*(1), S43-S51. doi: 10.3109/14992027.2013.832417

Castro, C. M., Wilson, C., Wang, F., & Schillinger, D. (2007). Babel babble: physicians' use of unclarified medical jargon with patients. *American Journal of Health Behavior, 1*(1), S85-95. doi:10.5993/AJHB.31.s1.11

Ching, T. Y., Oong, R., & Wanrooy, E. Van. (2006). The ages of intervention in Regions with and without universal newborn hearing screening and prevalence of childhood hearing impairment in Australia. *Australian and New Zealand Journal of Audiology*, *28*(2), 137-150. doi:10.1375/audi.28.2.137

Cone, B. K., Wake, M., Tobin, S., Poulakis, Z., & Rickards, F. W. (2010). Slight-mild sensorineural hearing loss in children: Audiometric, clinical, and risk factor profiles. *Ear and Hearing, 31*(2), 202-212. doi:10.1097/AUD.0b013e3181c62263

Couper, M. P., Singer, E., Levin, C. A., Fowler Jr, F. J., Fagerlin, A., & Zikmund-Fisher, B. J. (2010). Use of the Internet and ratings of information sources for medical decisions: Results from the DECISIONS survey. *Medical Decision Making, 30*(5), 106-114. doi:10.1177/0272989X10377661

Crossley, S. A., Skalicky, S., Dascalu, M., McNamara, D. S., & Kyle, K. (2017). Predicting text comprehension, processing, and familiarity in adult readers: New approaches to readability formulas. *Discourse Processes, 54*(5-6), 340-359. doi: 10.1080/0163853X.2017.1296264

D'Alessandro, D. M., Kingsley, P., & Johnson-West, J. (2001). The readability of pediatric patient education materials on the World Wide Web. *Archives of Pediatrics & Adolescent Medicine, 155*(7), 807.

Davis, T. C., Mayeaux, E. J., Fredrickson, D., Bocchini, J. A., Jackson, R. H., & Murphy, P.W. (1994). Reading ability of parents compared with reading level of pediatric patient education materials. *Pediatrics*, *93*(3), 460-468.

Digby, J. E., Purdy, S. C., Kelly, A. S., Welch, D., & Thorne, P. R. (2014). Are hearing losses among young Māori different to those found in the young NZ European population? *The New Zealand Medical Journal, 127*(1398), 98-110.

Digby, J., E. (2019). Deafness Notification Report (2018). Notified Cases of Hearing loss (not remediable by grommets) in New Zealanders under the age of 19. https://www.audiology.org.nz/assets/Uploads/DND/2018-Deafness-Notification-Database.pdf

Doak, C. C., Doak, L. G., & Root, J. H. (1996). *Teaching patients with low literacy skills*. J. B. Lippincott Company. https://www.hsph.harvard.edu/healthliteracy/resources/teaching-patients-with-low-literacy-skills/

Đoković, S., Gligorović, M., Ostojić, S., Dimić, N., Radić-Šestić, M., & Slavnić, S. (2014). Can mild bilateral sensorineural hearing loss affect developmental abilities in younger school-age children? *Journal of Deaf Studies and Deaf Education, 19*, 484-495.

Donald, A. J., & Kelly-Campbell, R. J. (2016). Pediatric audiology report: Assessment and revision of an audiology report written to parents of children with hearing impairment. *American Speech-Language-Hearing Association, 59*(2), 359-372. doi: 10.1044/2015_JSLHR-H-15-0120

Douglas, A., & Kelly-Campbell, R. J. (2018). Readability of patient-reported outcome measures in adult audiologic rehabilitation. *Journal of Speech, Language & Hearing Research, 27*(2), 208-218. doi: 10.1044/2018_AJA-17-0095

DuBay, W. H. (2004). *The principles of readability*. https://files.eric.ed.gov/fulltext/ED490073.pdf

Ekberg, K., Scarinci, N., Hickson, L., & Meyer, C. (2018). Parent-directed commentaries during children's hearing habilitation appointments: a practice in family-centred care. *International Journal of Language & Communication Disorders, 53*(5), 929-946. doi:10.1111/1460-6984.12403

Fagnano, M., Halterman, J. S., Conn, K. M., & Shone, L. P. (2012). Health literacy and sources of health information for caregivers of urban children with asthma. *Clinical Pediatrics, 51*(3), 267-273. doi:10.1177/0009922811421413

Feder, K. P., Michaud, D., McNamee, J., et al. (2017). Prevalence of hearing loss among a representative sample of Canadian children and adolescents, 3 to 19 years of age. *Ear & Hearing, 38*(1), 7-20.

Fitzpatrick, E., Angus, D., Durieux-Smith, A., Graham, I. D., & Coyle, D. (2008). Parents' needs following identification of childhood hearing loss. *American Journal of Audiology, 17*(1), 38-49. doi:10.1044/1059-0889(2008/005)

Fitzpatrick, E. M., Durieux-Smith, A., & Whittingham, J. (2010). Clinical practice for children with mild bilateral and unilateral hearing loss. *Ear and Hearing*, *31*, 392-400. doi:10.1097/AUD.0b013e3181cdb2b9

Fitzpatrick, E. M., Whittingham, J., & Durieux-Smith, A. (2014). Mild bilateral and unilateral hearing loss in childhood: A 20-year view of hearing characteristics, and audiologic

practices before and after newborn hearing screening. *Ear and Hearing, 35*(1), 10-18. doi: 10.1097/AUD.0b013e31829e1ed9

Fitzpatrick, E., Grandpierre, V., Durieux-Smith, A., Gaboury, I., Coyle, D., Na, E., & Sallam, N. (2016). Children with mild bilateral and unilateral hearing loss: parents' reflections on experiences and outcomes. *Journal of Deaf Studies and Deaf Education, 21*(1), 34-43. doi:10.1093/deafed/env047

Fitzpatrick, E. M., Al-Essa, R. S., Whittingham, J., et al. (2017). Characteristics of children with unilateral hearing loss. *International Journal of Audiology*, *56*, 819-828.

Fitzpatrick, E. M., Gaboury, I., Durieux-Smith, A., et al. (2018). Auditory and language outcomes in children with unilateral hearing loss. *Hearing Research, 372,* 42-51. doi:10.1016/j.heares.2018.03.015

Fitzpatrick, E. M., Coyle, D., Gaboury, I., Durieux-Smith, A., Whittingham, J., Grandpierre, V., Eunjung, N., & Salamatmanesh, M. (2019). Service preferences of parents of children with mild bilateral or unilateral hearing loss: a conjoint analysis study. *Ear and Hearing, 40*(3), 671-679. doi:10.1097/AUD.0000000000000651

Fox, S. (2006). *Online Health Search 2006*. Pew Research Center. https://www.pewresearch.org/internet/2006/10/29/online-health-search-2006/

Freda, M. C. (2005). The readability of American Academy of Pediatrics patient education brochures. *Journal of Pediatric Health Care, 19*(3), 151-156.

Friedman, D. B., & Hoffman-Goetz, L. (2006). A systematic review of readability and comprehension instruments used for print and web-based cancer information. *Health Education & Behavior*, *33*(3), 352-373. doi:10.1177/1090198105277329

Gibb, S., Milne, B., Shackleton, N., Taylor, B. J., & Audas, R. (2019) How universal are universal preschool health checks? An observational study using routine data from New Zealand's B4 School Check. *British Medical Journal Open, 9*(4), 1-11. doi:10.1136/bmjopen-2018-025535

Gomez, R., & Ferguson, M. (2020). Improving self-efficacy for hearing aid self-management: the early delivery of a multimedia-based education programme in first-time hearing aid users. *International Journal of Audiology, 59*(4), 272-281. doi:10.1080/14992027.2019.1677953

Grandpierre, V., Fitzpatrick, E. M., Na, E., & Mendonca, O. (2018). School-aged children with mild bilateral and unilateral hearing loss: parents' reflections on services, experiences, and outcomes. *The Journal of Deaf Studies and Deaf Education, 23*(2), 140-147. doi:10.1093/deafed/enx049

Hickson, L., Meyer, C., Lovelock, K., Lampert, M., & Khan, A. (2014). Factors associated with success with hearing aids in older adults. *International Journal of Audiology, 53*(1), S18-S27. doi:10.3109/14992027.2013.860488

Hoffmann, T., & Ladner, Y. (2012). Assessing the suitability of written stroke materials: An evaluation of the interrater reliability of the Suitability Assessment of Materials. *Topics in Stroke Rehabilitation., 19*(5), 417.

Holland, M. L., & Fagnano, M. (2008). Appropriate antibiotic use for acute otitis media: what consumers find using web searches. *Clinical Pediatrics, 47*(5), 452-456. doi:10.1177/0009922807313274

Holstrum, W. J., Gaffney, M., Gravel, J. S., Oyler, R. F., & Ross, D. S. (2008). Early intervention for children with unilateral and mild bilateral degrees of hearing loss. *Trends in Amplification, 12*(1), 35-41. doi:10.1177/1084713807312172

Horner, S. D., Surratt, D., & Juliusson, S. (2000). Improving readability of patient education materials. *Journal of Community Health Nursing, 17*(1), 15-23. doi: 10.1207/S15327655JCHN1701_02

Jansen, P., Bacal, K., & Crengle, S. (2008). *He Ritenga Whakaaro: Māori experiences of health services*. Māuri Ora Associates. https://www.moh.govt.nz/notebook/nbbooks.nsf/0/2A6CAF401ABBEFB9CC2575F4000B6D0C/$file/He-Ritenga-Whakaaro.pdf

Jilla, A. M., Johnson, C. E., Danhauer, J. L., Anderson, M., Smith, J. N., Sullivan, J. C., & Sanchez, K. R. (2020). Predictors of hearing aid use in the advanced digital era: an investigation of benefit, satisfaction, and self-efficacy. *Journal of the American Academy of Audiology, 31*(2), 87.

Jones, C. A., Mawani, S., King, K. M., Allu, S. O., Smith, M., Mohan, S., & Campbell, N. R. C. (2011). Tackling health literacy: Adaptation of public hypertension educational materials for an Indo-Asian population in Canada. *BMC Public Health, 11*(1), 24. doi::10.1186/1471-2458-11-24

Joubert, K., & Githinji, E. (2013). Quality and readability of information pamphlets on hearing and paediatric hearing loss in the Gauteng Province, South Africa. *International Journal of Pediatric Otorhinolaryngology, 78*(2), 354-358. doi: 10.1016/j.ijporl.2013.12.018

Kawaguchi, L., Wu, Y.-H., & Miller, C. (2019). The effects of amplification on listening self-efficacy in adults with sensorineural hearing loss. *American Journal of Audiology, 28*(3), 572-582. doi:10.1044/2019_AJA-18-0120

Kelly-Campbell, R. J., & McMillan, A. (2015). The relationship between hearing aid self-efficacy and hearing aid satisfaction. *American Journal of Audiology, 24*(4), 529-535. doi:10.1044/2015_AJA-15-0028

Kelly-Campbell, R., & Manchaiah, V. (2020). How to provide accessible hearing health information to promote patient-centered care. *Perspectives of the ASHA Special Interest Groups, 5*(1), 173-180. doi:10.1044/2019_PERSP-19-00044

Kessels, R. P. C. (2003). Patients' memory for medical information. *Journal of the Royal Society of Medicine*, *96*(5), 219-22. doi: 10.1258/jrsm.96.5.219

Klingbeil, C., Speece, M. W., & Schubiner, H. (1995). Readability of pediatric patient education materials: current perspectives on an old problem. *Clinical Pediatrics, 34*(2), 96-102.

Kong, K., & Hu, A. (2015). Readability assessment of online tracheostomy care resources. *Otolaryngology-Head and Neck Surgery, 152*(2), 272-278. doi: 10.1177/0194599814560338

Kunst, H., Groot, D., Latthe, P. M., Latthe, M., & Khan, K. S. (2002). Accuracy of information on apparently credible websites: survey of five common health topics. *British Medical Journal, 324*(7337), 581-582. doi:10.1136/bmj.324.7337.581

Kuppler, K., Lewis, M., & Evans, A. (2013). A review of unilateral hearing loss and academic performance: Is it time to reassess traditional dogmata? *International Journal of Pediatric Otorhinolaryngology, 77*, 617-622. doi: 10.1016/j. I jporl.2013.01.014

Lampert, A., Wien, K., Haefeli, W. E., & Seidling, H. M. (2016). Guidance on how to achieve comprehensible patient information leaflets in four steps. *International Journal for Quality in Health Care, 28*(5), 634-638. doi:10.1093/intqhc/mzw077

Laplante-Lévesque, A., Hickson, L., & Worrall, L. (2010). A qualitative study of shared decision making in rehabilitation audiology. *Journal of the Academy of Rehabilitative Audiology, 43*, 27.

Laplante-Lévesque, A., Brännström, K. J., Andersson, G., Lunner, T. (2012). Quality and readability of English-language internet information for adults with hearing impairment and their significant others. *International Journal of Audiology, 51*(8), 618-626.

Laplante-Lévesque, A., Thorén, E. S. (2015). Readability of internet information on hearing: Systematic literature review. *American Journal of Audiology, 24*(3), 284-288. doi: 10.1044/2015_AJA-14-0091

Légaré, F., & Witteman, H. O. (2013). Shared decision making: Examining key elements and barriers to adoption into routine clinical practice. *Health Affairs, 32*(2), 276-284. https://doi.org/10.1377/hlthaff.2012.1078

Ley, P., & Florio, T. (1996). The use of readability formulas in health care. *Psychology, Health & Medicine*, *1*(1), 7-28. doi: 10.1080/13548509608400003

Manchaiah, V., Dockens, A. L., Flagge, A., Bellon-Harn, M., Azios, J. H., Kelly-Campbell, R. J., & Andersson, G. (2019). Quality and readability of English-language internet information for tinnitus. *Journal of the American Academy of Audiology, 30*(1), 31-40. doi:10.3766/jaaa.17070

McCormack, L., Bann, C., Squiers, L., Berkman, N. D., Squire, C., Schillinger, D., Ohene-Frempong, J., & Hibbard, J. (2010). Measuring health literacy: A pilot study of a new skills-based instrument. *Journal of Health Communication, 15*(2), 51-71. doi: 10.1080/10810730.2010.499987

McGee, J. (2010). *Toolkit for making written material clear and effective*. U.S Department of Health and Human Services, Center for Medicare and Medicaid Services. https://www.cms.gov/Outreach-and-Education/Outreach/WrittenMaterialsToolkit

McInnes, N., & Haglund, B. J. A. (2011). Readability of online health information: Implications for health literacy. *Informatics for Health & Social Care, 36*(4), 173-189. doi: 10.3109/17538157.2010.542529

McKay, S., Gravel, J. S., Tharpe, A. M. (2008). Amplification considerations for children with minimal or mild bilateral hearing loss and unilateral hearing loss. *Trends in Amplification, 12*, 43-54.

McMullan, A., Kelly-Campbell, R. J., & Wise, K. (2018). Improving hearing aid self-efficacy and utility through revising a hearing aid user guide: A pilot study. *American Journal of Audiology, 27*(1), 45-56. doi:10.1044/2017_AJA-17-0035

McNamara, D. S., Kintsch, E., Songer, N. B., & Kintsch, W. (1996). Are good texts always better? Interactions of text coherence, background knowledge, and levels of understanding in learning from text. *Cognition and Instruction, 14*(1), 1-43. doi: 10.1207/s1532690xci1401_1

Ming, J., & Kelly-Campbell, R. J. (2018). Evaluation and revision of a tinnitus brochure. *Speech,Language and Hearing, 21*(1), 22-29. doi:10.1080/2050571X.2017.1316920

Ministry of Education. (2020). *Educational attainment in the adult population*. https://www.educationcounts.govt.nz/indicators/main/education-and-learning-outcomes/educational_attainment_in_the_adult_population

Ministry of Health. (2010). *Kōrero Mārama: Health Literacy and Māori Results from the 2006 Adult Literacy and Life Skills Survey.* https://www.health.govt.nz/system/files/documents/publications/korero-marama.pdf

Ministry of Health. (2012). *Rauemi Atawhai a guide to developing health education resources in New Zealand*. http://www.health.govt.nz/system/files/documents/publications/rauemiatawhai4web.pdf

Ministry of Health. (2013). *Well Child / Tamariki Ora Programme Practitioner Handbook: Supporting families and whānau to promote their child's health and development.* Revised 2014. https://www.health.govt.nz/publication/well-child-tamariki-ora-programme-practitioner-handbook-2013

Moeller, M. P. (2000). Early intervention and language development in children who are deaf and hard of hearing. *Pediatrics, 106*(3), E43.

Moore, D. R., Zobay, O., & Ferguson, M. A. (2019). Minimal and mild hearing loss in children: Association with auditory perception, cognition, and communication problems. *Ear and Hearing*, *41*(4), 720-732. doi:10.1097/AUD.0000000000000802

Most, T. (2006). Assessment of school functioning among Israeli Arab children with hearing loss in the primary grades. *American Annals of the Deaf*, *151*(3), 327-335.

Nasser, S., Mullan, J., & Bajorek, B. (2012). Assessing the quality, suitability and readability of internet-based health information about warfarin for patients. *The Australasian Medical Journal, 5*(3), 194. doi: 10.4066/AMJ.2012862

National Screening Unit (NSU). (2014, December 2). *Universal Newborn Hearing Screening Programme.* https://www.nsu.govt.nz/health-professionals/universal-newborn-hearing-screening-programme

Nickbakht, M., Meyer, C., Scarinci, N., & Beswick, R. (2019). A qualitative investigation of families' needs in the transition to early intervention after diagnosis of hearing loss. *Child: Care, Health and Development, 45*(5), 670-680. doi:10.1111/cch.12697

Institute of Medicine. (2004). *Health Literacy: A Prescription to End Confusion*. National Academies Press. doi: 10.17226/10883

Northern. J. L, & Downs, M. P. (2014). Hearing in Children (6th ed.). Williams & Wilkins.

Nutbeam, D. (2008). The evolving concept of health literacy. *Social Science & Medicine*, *67*(12), 2072-2078. doi: 10.1016/j.socscimed.2008.09.050

Nutbeam, D., McGill, B., & Premkumar, P. (2018). Improving health literacy in community populations: a review of progress. *Health Promotion International, 33*(5), 901-911. doi:10.1093/heapro/dax015

Oedekoven, M., Herrmann, W. J., Ernsting, C., Schnitzer, S., Kanzler, M., Kuhlmey, A., & Gellert, P. (2019). Patients' health literacy in relation to the preference for a general practitioner as the source of health information. *BMC Family Practice, 20*(1), 94-10. doi:10.1186/s12875-019-0975-y

Paasche-Orlow, M. K., Taylor, H. A., & Brancati, F. L. (2003). Readability standards for informed-consent forms as compared with actual readability. *Massachusetts Medical Society, 348*(8), 721-726. doi: 10.1056/NEJMsa021212

Parikh, N. S., Parker, R. M., Nurss, J. R., Baker, D. W., & Williams, M. V. (1996). Shame and health literacy: the unspoken connection. *Patient Education and Counseling, 27*(1), 33-39. doi:10.1016/0738-3991(95)00787-3

Parker, R. M. & Ratzan, S. C. (2000). Introduction. In C. R. Selden, M. Zorn, S. C. Ratzan, R. M. Parker (Eds.), *Current Bibliographies in Medicine: Health Literacy*. (pp. v—vii). National Library of Medicine. https://www.nlm.nih.gov/archive/20061214/pubs/cbm/hliteracy.html

Pothier, L., Day, R., Harris, C., & Pothier, D. D. (2008). Readability statistics of patient information leaflets in a Speech and Language Therapy Department. *International Journal of Language & Communication Disorders, 43*(6), 712-722. doi:10.1080/13682820701726647

Prieto, J. M., West-Santos, C., Montgomery, A. S., Patwardhan, U., Lazar, D. A., Thangarajah, H., Bickler, S. W., Huang, E. Y., Fairbanks, T. J., & Ignacio, R. C. (2019). Patient-oriented online resources in pediatric surgery: Are we failing the readability test? *Journal of Pediatric Surgery*, *55*(10), 2048-2051. doi: 10.1016/j.jpedsurg.2019.11.018

Prins, E., & Mooney, A. (2014). Literacy and health disparities. *New Directions for Adult and Continuing Education, 2014*(142), 25-35. doi:10.1002/ace.20092

Pryce, H., & Hall, A. (2014). The role of shared decision-making in audiologic rehabilitation. *Perspectives on Aural Rehabilitation and Its Instrumentation, 21*(1), 15-23. doi:10.1044/arri21.1.15

Rasu, R. S., Bawa, W. A., Suminski, R., Snella, K., & Warady, B. (2015). Health literacy impact on national healthcare utilization and expenditure. *International Journal of Health Policy and Management, 4*(11), 747-755. doi:10.15171/ijhpm.2015.151

Redish, J. C. (1981). Understanding the limitations of readability formulas. *IEEE Transactions on Professional Communication*, *PC-24*(1), 46-48. doi:10.1109/tpc.1981.6447824

Ross, D. S., Holstrum, W. J., Gaffney, M., Green, D., Oyler, R. F., & Gravel, J. S. (2008). Hearing screening and diagnostic evaluation of children with unilateral and mild bilateral hearing loss. *Trends in Amplification, 12*(1), 27-34. doi:10.1177/1084713807306241

Roush, J., & Kamo, G. (2014). Counselling and Collaboration with Parents of Children with Hearing Loss. In J. R. Madell & C. Flexer (Eds.), *Pediatric Audiology Diagnosis,Technology, and Management* (2nd ed., pp. 378-387). Thieme Medical Publishers.

Rudd, R. E. (2010). Improving Americans' health literacy. *The New England Journal of Medicine, 363*(24), 2283-2285. doi:10.1056/NEJMp1008755

Russ, S. A., Kuo, A. A., Poulakis, Z., Barker, M., Rickards, F., Saunders, K., Jarman, F. C., Wake, M., & Oberklaid, F. (2004). Qualitative analysis of parents' experience with early detection of hearing loss. *Archives of Disease in Childhood*, *89*(4), 353-358. doi:10.1136/adc.2002.024125

Sanders, L. M., Federico, S., Klass, P., Abrams, M. A., & Dreyer, B. (2009). Literacy and child health: A systematic review. *Archives of Pediatrics & Adolescent Medicine*, *163*(2), 131-140. doi: 10.1001/archpediatrics.2008.539

Scarinci, N., Erbasi, E., Moore, E., Ching, T. Y. C., & Marnane, V. (2018). The parents' perspective of the early diagnostic period of their child with hearing loss: Information and support. *International Journal of Audiology, 57*, S3-S14. doi:10.1080/14992027.2017.1301683

Shieh, C., & Hosei, B. (2008). Printed health information materials: evaluation of readability and suitability. *Journal of Community Health Nursing*, *25*(2), 73-90. doi:10.1080/07370010802017083

Shoemaker, S. J., Wolf, M. S., & Brach, C. (2014). Development of the Patient Education Materials Assessment Tool (PEMAT): A new measure of understandability and actionability for print and audiovisual patient information. *Patient Education and Counseling*, *96*(3), 395-403. doi:10.1016/j.pec.2014.05.027

Smith, F., Carlsson, E., Kokkinakis, D., Forsberg, M., Kodeda, K., Sawatzky, R., Friberg, F., & Ohlen, J. (2013). Readability, suitability and comprehensibility in patient education materials for Swedish patients with colorectal cancer undergoing elective surgery: A mixed method design. *Patient Education and Counseling, 94*(2), 202-209.

Smith, S. L., & Fagelson, M. (2011). Development of the self-efficacy for tinnitus management questionnaire. *Journal of the American Academy of Audiology, 22*(7), 424-440. doi:10.3766/jaaa.22.7.4

Smith, S. L., & West, R. L. (2006). The application of self-efficacy principles to audiologic rehabilitation: A tutorial. *American Journal of Audiology, 15*(1), 46-56. doi:10.1044/1059-0889(2006/006)

Sørensen, K., Van Den Broucke, S., Fullam, J., Doyle, G., Pelikan, J., Slonska, Z., Brand, H., & (2012). Health literacy and public health: A systematic review and integration of

definitions and models. *BMC Public Health, 12*(80), 1-13. doi:10.1186/1471-2458-12-80

Stacey, D., Hill, S., McCaffery, K., Boland, L., Lewis, K. B., & Horvat, L. (2017). Shared decision making interventions: Theoretical and empirical evidence with implications for health literacy. *Studies in Health Technology and Informatics, 240*, 263.

Statistics New Zealand (2014). *Disability Survey: 2013.* https://www.stats.govt.nz/information-releases/disability-survey-2013

Statistics New Zealand (2018). https://www.stats.govt.nz/reports/parenting-and-fertility-trends-in-new-zealand-2018

Statistics New Zealand (2018). Teen birth rate halves since 2018. https://www.stats.govt.nz/news/teen-birth-rate-halves-since-2008

Stossel, L. M., Segar, N., Gliatto, P., Fallar, R., & Karani, R. (2012). Readability of patient education materials available at the point of care. *Journal of General Internal Medicine, 27*(9), 1165-1170. doi: 10.1007/s11606-012-2046-0

Tattersall, H., & Young, A. (2006). Deaf children identified through newborn hearing: Parents' experiences of the diagnostic process. *Child Care Health and Development*, *32*, 33-45. doi:10.1111/j.1365-2214.2006.00596.x

Tharpe, A. M. (2008). Unilateral and mild bilateral hearing loss in children: Past and current perspectives. *Trends in Amplification, 12*, 7-15. doi:10.1177/1084713807304668

Tomblin, J. B., Oleson, J. J., Ambrose, S. E., Walker, E., & Moeller, M. P. (2014). The influence of hearing aids on the speech and language development of children with hearing loss. *JAMA Otolaryngology-Head & Neck Surgery, 140*, 403-409. doi:10.1001/jamaoto.2014.267

Vadaparampil, S. T., & Pal, T. (2010). Updating and refining a study brochure for a cancer registry-based study of BRCA mutations among young African American breast cancer patients: Lessons learned. *Journal of Community Genetics*, *1*(2), 63-71. doi:10.1007/s12687-010-0010-4

Wake, M., Tobin, S., Cone-Wesson, B., et al. (2006). Slight/mild sensorineural hearing loss in children. *Pediatrics, 118*, 1842-1851.

Walker, E. A., Spratford, M., Moeller, M. P., Oleson, J., & Ou, H. (2013). Predictors of hearing aid use time in children with mild-to-severe hearing loss. *Language and Speech Hearing Services in Schools, 44*, 73-88.

Walker, E. A., Holte, L., McCreery, R. W., Spratford, M., Page, T., & Moeller, M. P. (2015). The influence of hearing aid use on outcomes of children with mild hearing loss. *Journal of Speech, Language, and Hearing Research, 58*, 1611-1625. doi:10.1044/2015_JSLHR-H-15-0043

Wang, L.-W., Miller, M. J., Schmitt, M. R., & Wen, F. K. (2013). Assessing readability formula differences with written health information materials: Application, results, and recommendations. *Research in Social and Administrative Pharmacy, 9*(5)*,* 503-516. doi: 10.1016/j.sapharm.2012.05.009

Weintraub, D., Maliski, S. L., Fink, A., Choe, S., & Litwin, M. S. (2004). Suitability of prostate cancer education materials: applying a standardized assessment tool to currently available materials. *Patient Education and Counseling, 55*(2), 275-280. doi: 10.1016/j.pec.2003.10.003

Weiss, B. D. (2003). *Health literacy: A manual for clinicians*. American Medical Association. http://lib.ncfh.org/pdfs/6617.pdf

Winiger, A. M., Alexander, J. M., Diefendorf, A. O. (2016). Minimal hearing loss: From a failure-based approach to evidence-based practice. *American Journal of Audiology, 25*, 232-245

Wong, K., & Levi, J. R. (2017). Readability of pediatric otolaryngology information by children's hospitals and academic institutions: Pediatric otolaryngology readability. *The Laryngoscope, 127*(4), E138-E144. doi: 10.1044/2015_AJA-14-0091

World Health Organisation. (2004). *The Global Burden of Disease 2004 update*. https://apps.who.int/iris/bitstream/handle/10665/43942/9789241563710_eng.pdf

World Health Organisation. (2013). *Health 2020: a European policy framework supporting action across government and society for health and well-being.* https://www.euro.who.int/__data/assets/pdf_file/0006/199536/Health2020-Short.pdf

World Health Organisation. (2020). *Deafness and Hearing Loss*. https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss

Wynd, D. (2015). It shouldn't be this hard: children, poverty and disability. Child Poverty Action Group. https://www.cpag.org.nz/assets/150317ChildDisability.pdf

Yin, H. S., Forbis, S. G., Dreyer, B. P. (2007). Health literacy and pediatric health. *Current Problems in Pediatric and Adolescent Health Care, 37*(7), 258-286. doi: 10.1016/j.cppeds.2007.04.002

Yin, H. S., Gupta, R. S., Tomopoulos, S., Wolf, M. S., Mendelsohn, A. L., Antler, L., Sanchez, D. C., Lau, C. H., & Dreyer, B. P. (2013). Readability, suitability, and characteristics of asthma action plans: examination of factors that may impair understanding. *Pediatrics, 131*(1), e116-e126.

Yoshinaga-Itano, C., Johnson, C. D., Carpenter, K., & Brown, A. S. (2008). Outcomes of children with mild bilateral hearing loss and unilateral hearing loss. *Seminars in Hearing, 29*(2), 196-211. doi:10.1055/s-2008-1075826

Zaidman-Zait, A., Most, T., Tarrasch, R., & Haddad, E. (2018). Mothers' and fathers' involvement in intervention programs for deaf and hard of hearing children. *Disability and Rehabilitation, 40*(11), 1301-1309. doi:10.1080/09638288.2017.1297491

Zamora, H., & Clingerman, E. M. (2011). Health literacy among older adults: A systematic literature review. *Journal of Gerontological Nursing*, *37*(10), 41-51. doi:10.3928/00989134-20110503-02

APPENDICES

Appendix A: Best Practice Guidelines

Planning	Determining the target audience is the first step in the planning stage. This involves understanding the characteristics of the intended recipients and clearly defining the messages and key objectives of the resource (Doak et al., 1996; MoH, 2012). Characteristics of the audience involve age, gender, culture, and literacy levels (Doak et al., 1996). Ensuring a match between the intended audience and manner in which health information is presented, is vital to achieving suitability. For example, "if all New Zealanders are the intended audience, the resource should reflect the cultural, ethnic and disability diversity found throughout New Zealand" (MoH, 2012, p 23). Determining the purpose and goals of the resource will help define the scope for example: increasing audience knowledge, effecting a change in behavior, or prompting action (MoH, 2012). This can also help to determine which tools are most suitable to use.	
Writing & Production	*Content*	The purpose of the document needs to be readily obvious to the reader in order for them to understand the intention and not miss the point. To effect this, the purpose should be explicitly stated in the title, cover illustration, or introduction. Topics within the content should be aimed at the application of knowledge or skills which promote desirable reader behavior. This information should be directly aimed at helping the reader to solve their problem. The scope should be limited to the essential information necessary for the purpose of the document, and no more than can be reasonably expected to be learnt in the allowable time. A summary is also recommended to enable key points to be reiterated using different words and including examples to enhance learning.
	Literacy demand	Literacy demand incorporates a RGL of 5 or less using a readability formula which estimates the level of reading difficulty. Conversational style and an active voice are recommended with simple sentences and an absence of embedded information making passages easier to understand and speeding up the reading process. Vocabulary factors such as use of common and imagery words, and examples used to explain technical, concept, value judgement, and category words should be used. Using context prior to introduction of new information, and road signs (advance organisers) to signal a new topic serve to enhance learning.

	Graphics	The authors recommend that the cover graphic be friendly, attractive and clearly related to the purpose of the material. Illustrations should be either familiar, or simple and easily recognisable without distracting detail. They should be relevant to the information, and promote the key messages. Elaborate borders, colours, or unnecessary illustrations can detract from the message. Any tables, charts or graphs need to include step by step directions or explanations to promote comprehension and self-efficacy. Finally, any graphics must contain a caption so the reader can easily tell what the graphic is about.
	Layout & Typography	Layout can have a significant impact on the suitability of materials. The authors recommend at least 5 of the following factors be present in the document: • Illustrations are adjacent to the related text. • Layout and sequence of information are consistent, making it easy to predict the flow of information. • Visual cueing devices (boxes, arrows, shading) are used to direct attention to key content. • Pages do not appear cluttered. • Use of colour supports and is not distracting to the message. Readers need not learn colour codes to understand and use the message. • Line length is 30 to 50 characters and spaces. • There is high contrast between type and paper. • Paper has a non-gloss or low-gloss surface. The type and size of the font can also affect ease of reading. Using all caps and different font types and sizes can make the material look confusing. The type size should be at least 12 and typographic cues such as bold type can be used to emphasise key points. Lists should be grouped under subheadings as adults with low levels of literacy can only remember lists with 3-5 items.

	Learning Stimulation & Motivation	Providing interactions in terms of asking the reader to solve problems or make choices for example, can promote long term memory retention. This can be included in the text and/or the graphic. Modelling specific desired behaviours or skills through observation or familiar instances can enhance learning stimulation, and motivation can be enhanced by dividing complex topics into smaller parts. If people are able to experience small successes in problem solving or understanding this can lead to self-efficacy.
	Cultural Appropriateness	Providing a cultural match to the intended audience revolves around measure of logic, language, and experience. Central concepts of the material should be similar to the culture of the target readers. Cultural images used need to present the culture in positive ways.
Testing	Learner verification is a vital part of assessing the comprehension and suitability of a material and should be undertaken by qualitative assessment of the target population (Lampert et al., 2016). Inclusion and exclusion criteria need to be formulated in order to ensure the target audience are representative, and those with low literacy levels are also included (Weiss, 2003). To effect this, two groups of equal size may be recruited, with one group required to read the original material and the other the revised version. Measures of self-efficacy and comprehension are suggested to be the most useful constructs to determine improvement of a written material (Doak et al., 1996). Comprehension measures can determine the reader's ability to correctly interpret the message and demonstrate understanding, whereas self-efficacy assesses the reader's confidence in their ability to carry out instruction and subsequently manage their health (Doak et al., 1996). Comprehension can be assessed by the use of knowledge questions regarding key objectives (Lampert et al., 2016), while self-efficacy can be measured by asking participants to rate their level of confidence in the understanding of the key messages (Ming & Kelly-Campbell, 2018). Another important aspect of verification is obtaining feedback from members of the target audience in terms of the suitability and attractiveness of the material (Caposecco et al., 2011).	

Appendix B: Human Ethics Committee Approval Letter

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

HUMAN ETHICS COMMITTEE

Secretary, Rebecca Robinson
Telephone: +64 03 369 4588, Extn 94588
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2019/07/LR Amendment 2

14 February 2020

Rebecca Kelly
Psychology, Speech and Hearing
UNIVERSITY OF CANTERBURY

Dear Rebecca

Thank you for your request for an amendment to your research proposal "Quality of Hearing-Related Internet Information" as outlined in your email dated 10th February 2020.

I am pleased to advise that this request has been considered and approved by the Human Ethics Committee.

Yours sincerely

Dr Dean Sutherland
Chair, Human Ethics Committee

Appendix C : Mild Hearing Loss Brochure

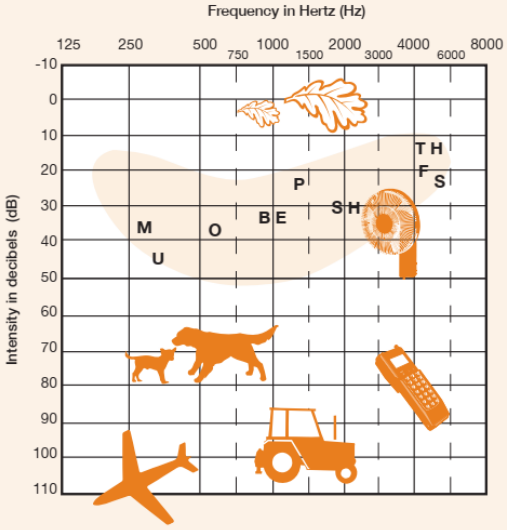
What is mild hearing loss?

I have been told my child has a mild hearing loss.

What does this mean?

A mild hearing loss means that your child's hearing is slightly below the level that is considered normal. Your child's hearing specialist (audiologist) will be able to explain which sounds your child can hear and which sounds your child may have difficulty hearing.

The diagram below shows how your child hears low and high pitched sounds. A person with normal hearing can hear very soft sounds at 15 decibels or less. The speech sounds shown on the diagram have a loudness of about 20 to 40 decibels. A mild hearing loss can make it hard to hear soft speech sounds.



Why does my child have a hearing loss?

It is not always possible to determine the cause of a hearing loss. Your audiologist will be able to refer you to an otolaryngologist ear, nose and throat (ENT) specialist or paediatrician who will help you explore the possible reasons for your child's hearing loss. Often it is hard to find the cause of hearing loss. In 50 to 60 percent of cases of permanent hearing loss in New Zealand no known cause is found.

How will having a mild hearing loss affect my child?

In young children, it can be difficult to tell that they have a mild hearing loss. While your child is likely to hear well in most environments, there may be a few situations in which your child may have more difficulty.

Children with a mild hearing loss may have difficulty:

- understanding speech in a noisy environment
- hearing quiet voices or soft sounds such as *s*, *t*, *th* and *f*.

Sometimes a mild hearing loss can affect speech development. Soft sounds like 's' are important for spoken English. If there is a concern about speech development, an assessment by a speech language therapist is recommended.

How can I help my child to hear?

A child with a mild hearing loss may have difficulty hearing when they are listening in a noisy environment. There are lots of ways you can help your child, for example:

- reduce background noise when possible – at home you can turn off TVs and radios when they are not in use, and close doors
- move away from noises when you want your child to hear you
- get your child's attention before you start talking
- make eye contact with your child when you are communicating – this will help hold your child's attention
- move closer to your child when talking so that your voice reaches your child's ears as clearly and loudly as possible. Within one metre is often thought of as a good distance.

Ear infections can cause a temporary deterioration in hearing, which may especially affect a child with mild hearing loss. Prompt attention from your family doctor when you suspect your child has an ear infection can limit this impact.

How can I talk to my child so that my words sound clearer?

The most important thing you can do is to continue to talk naturally to your child. The following visual strategies may also be helpful.

- Use facial expressions and natural gestures as they provide additional 'clues' to aid your child's understanding. You may want to use some New Zealand Sign language to support your child's understanding.
- Keep still when talking. This will help your child to see your lip patterns, facial expressions and gestures.

Will a hearing aid be helpful for my child?

Some children can benefit from wearing hearing aids and some may not. The decision about using a hearing aid or other technology can be reviewed as your child develops. The child's changing needs and typical listening environments are also important factors to the decision you make. Classrooms can be noisy, making it difficult for a child with mild hearing loss to hear speech clearly, so monitoring of hearing in the classroom is advised. The audiologist will be able to advise whether or not hearing aids are likely to be beneficial.

What will happen as my child grows up?

It is important that your child's hearing loss is recognised and supported. You can help important people learn how best to communicate with your child by advising them of strategies that improve hearing and understanding.

The audiologist should assess your child's hearing regularly in order to help build up a full description of the quietest sounds your child can hear at different pitches in each ear. In this way, any changes in your child's hearing will be picked up quickly. If you suspect your child's hearing has changed, contact your local audiology clinic.

If you have any concerns about your child's speech, language, communication and learning development please contact your audiologist, who may refer you to the Ministry of Education.

More information

The New Zealand Federation for Deaf Children (NZFDC) is an organisation which offers parent-to-parent support and advice to families and whānau of children with hearing loss.

Your child's audiologist can refer you or you can contact them directly by:

Freephone: 0800 DEAFCHILD (0800 332 324)

Text: 027 214 6901

Email: deafchildren@xtra.co.nz

Website: www.deafchildren.org.nz

For more information about children's hearing loss, and support available go to the:

- Ministry of Health website www.health.govt.nz
- Ministry of Education website www.minedu.govt.nz/NZEducation/Education Policies/SpecialEducation/ServicesAndSupport/DeafAndHearingImpaired.aspx
- Ministry of Education resource *Getting Started* – available from www.minedu.govt.nz

MINISTRY OF HEALTH
MANATŪ HAUORA
National Screening Unit
New Zealand Government
www.nsu.govt.nz

March 2014 HP 5820

Appendix D: Revised Brochure

What does mild hearing loss mean for my child?

What does mild hearing loss mean?

Mild hearing loss means that your child may not hear some quiet sounds and quiet speech clearly. Your audiologist can show you what your child can and can't hear.
Your child might not be able to hear things like:

- soft speech sounds.
- leaves rustling.
- a small bird chirping.

Why does my child have a hearing loss?

We don't always know why hearing loss happens. Your audiologist can refer your child to see other doctors who can try to find out why. 50-60% of the time the reason for any hearing loss cannot be found.

How will this affect my child?

It might be hard to tell that your child has a mild hearing loss. Your child can probably hear well in most places. They will have trouble:

- understanding speech in noisy places.
- hearing quiet voices or soft speech sounds such as; *p, h, s*, *t*, *th* and *f*. For example; 'ka pai', 'mihi' 'swim', 'this' or 'fish'.

Sometimes your child's speech can be affected by their hearing loss. Soft sounds like 's' and 'f' are important for learning to speak. If your child can't hear a sound they won't be able to say it. If you often can't understand what your child is saying, ask to see your audiologist.

How can I help my child?

Try these tips:

- Make background noises quieter. Turn off the TV or close doors.
- Move away from noises when you talk to your child.
- Get your child's attention before talking with them.
- Look at your child when you talk to them.
- Move to within 1 metre of your child when talking.

You can help other people learn how to talk with your child by sharing these tips.

Think about what it is like for you to hear when you wear earplugs. It is likely to be the same for your child.

How can I talk to my child?

- Talk normally to your child.
- Use facial expressions and gestures.
- You can use some New Zealand Sign language if you want to.
- Keep still when talking.

Talking to your child

What happens as my child grows up?

Your child's needs will change over time. When your child goes to day care or school, the classrooms can be noisy. Noise can make it hard for your child to hear speech clearly.

Tell your audiologist if you are worried about your child's speech, language or learning. Ask for information about your child that you can pass on to the day care or school.

Your audiologist will advise you how often your child's hearing and language needs to be checked. They may also give you a checklist to help you see how your child is going.

Will my child need hearing aids?

Hearing aids might help your child. Talk with your audiologist. They can help you decide if you want to try them as your child grows.

What if my child gets an ear infection?

Most children get ear infections at some point. If your child has an ear infection, their hearing may get worse. Watch for these signs:

- Your child is pulling at their ear.
- Your child has a fever.
- Your child has pus coming from their ear.

If your child wears hearing aids, and their hearing gets worse when they are unwell, contact your audiologist.

Where can I get more help?

- If your child has an ear infection, ring your child's GP and audiologist.
- If you are concerned about your child's hearing needs, ring your audiologist.
- If you are concerned about your child's speech, talk with your audiologist and teachers/carers.
- If you want to connect with other parents, talk with your advisor on deaf children if you have one, or ring Deaf Children NZ. Freephone 0800DEAFCHILD (0800 332 324). Text: 027 214 6901. You can visit them on the web at: www.deafchildren.org.nz.

Where can I get more information?

Ministry of Health: www.health.govt.nz

Ministry of Education: www.education.govt.nz/school/student/-support/special-education/supporting-children-who-are-deaf-and-hard-of-hearing/

National Screening Unit: www.nsu.govt.nz/pregnancy-newborn-screening/universal-newborn-hearing-screening-programme

Appendix E: Demographic Questionnaire

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CHRISTCHURCH NEW ZEALAND

QUESTIONNAIRE

Please answer the following questions

1. Gender:

☐ Male ☐ Female ☐ Non-Binary

2. Years of age:

3. Which ethnic group do you belong to?

☐ New Zealand European ☐ Māori

☐ Samoan ☐ Cook Island Māori

☐ Tongan ☐ Niuean

☐ Chinese ☐ Indian

☐ Other Please state:

4. What is your highest qualification? *(E.g. NCEA/school certificate, degree/diploma, trade certificate etc.)*

Appendix F: Learner Verification Questionnaire

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CHRISTCHURCH NEW ZEALAND

Part 1. In this section, you will be asked questions about how well you understood what was in the report. Please read each question and choose the answer you think is correct.

1. Which of the following statements is TRUE about your child's hearing?

a. He/she will need hearing aids.
b. He/she may not be able to hear quiet sounds and quiet speech.
c. It is normal.
d. He/she will have trouble hearing only in noisy situations.

2. Which of these statements is FALSE about how your child's hearing loss will affect him/her?

a. He/she will have difficulty in noisy situations such as day care or classrooms.
b. He/she will only have trouble hearing when they go to school.
c. He/she may have trouble learning to speak.
d. His/her hearing may get worse while they have an ear infection.

3. Which of the following statements is FALSE about how you can talk to your child?

a. Speak loudly to him/her.
b. Keep still while talking.
c. Look at him/her when you talk to them.
d. Use facial expressions and gestures.

4. Will your child need hearing aids?

a. Yes definitely.
b. Only if he/she has trouble speaking.
c. No, hearing aids are not needed for a mild hearing loss.

d. Possibly. Your audiologist can help you decide what is best as your child grows.

5. Which of the following statements is FALSE about how you can help your child to hear?

a. Turn off the TV or close doors.
b. Move away from noises.
c. Get his/her attention before you speak.
d. Move to within 2 metres of your child.

6. What should you do if you are concerned about your child's speech?

a. Talk to your audiologist.
b. Ring your child's GP.
c. Take him/her straight to the doctor.
d. Wait and see if it gets better.

Part 2. In this section, you will be asked questions about how confident you feel about your understanding of the brochure. Please read each question and choose the answer you think best describes your level of confidence.

1. After reading the brochure, how confident are you that you understand the terms in the brochure?

Not confident	Slightly confident	Moderately confident	Confident	Very confident

2. After reading the brochure, how confident are you that you understood the information in the brochure?

Not confident	Slightly confident	Moderately confident	Confident	Very confident

3. After reading the brochure, how confident are you that you understood the recommendations?

Not confident	Slightly confident	Moderately confident	Confident	Very confident

Part 3. In this section, you will be asked questions about your opinion of the report. Please read each question and choose the answer you think best describes your opinion.

1. The brochure was what I expected it to be.

Strongly agree Agree Somewhat agree Neither agree nor disagree Somewhat disagree Disagree Strongly disagree

2. I found the brochure confusing.

Strongly agree Agree Somewhat agree Neither agree nor disagree Somewhat disagree Disagree Strongly disagree

3. The brochure was useful to me.

Strongly agree Agree Somewhat agree Neither agree nor disagree Somewhat disagree Disagree Strongly disagree

4. I felt frustrated reading the brochure.

Strongly agree Agree Somewhat agree Neither agree nor disagree Somewhat disagree Disagree Strongly disagree

5. The order of information in the brochure was helpful.

Strongly agree Agree Somewhat agree Neither agree nor disagree Somewhat disagree Disagree Strongly disagree

6. I thought the brochure was a good length.

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

7. I thought the brochure was hard to read without some help.

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

8. I thought the brochure used too much "jargon."

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Do you have any comments about how easy to read and understand you found this brochure?